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CRATÆGUS IN EASTERN PENNSYLVANIA.

BY C. S. SARGENT.

This preliminary sketch of the genus *Cratægus* in eastern Pennsylvania is based chiefly on the large collections and copious field notes made during the last five years by Mr. Benjamin H. Smith, of Philadelphia, in Delaware, Philadelphia and Chester counties, by Dr. C. D. Fretz, of Sellersville, in Bucks county principally in the neighborhood of Sellersville and at Durham, and by Mr. C. L. Gruber in Berks county, largely near Kutztown, and in North Heidelberg township. Their careful observations and assistance have made this publication possible. A few specimens collected by the late Prof. Porter in Easton, Northampton county, and by Mr. A. MacElwee, of the Philadelphia Museums, are also included. Previous to his death in 1904, Mr. W. M. Canby, of Wilmington, Delaware, had become interested in the thorns of eastern Pennsylvania, and together we had collected considerable material in Bucks, Delaware and Monroe counties during several journeys that we made for the purpose of studying the genus in this interesting region.

This paper is published at this time with no idea that it is exhaustive or final, but to show the richness of eastern Pennsylvania in forms of this genus, and with the hope that this unexpected revelation will lead other botanists living in that part of the State to carry on the work of investigation so ably begun by their associates.

The following arrangement of the natural groups in which the species of eastern Pennsylvania may be arranged will perhaps prove helpful in the study of the group.

CONSPPECTUS OF THE NATURAL GROUPS OF THE SPECIES OF EASTERN PENNSYLVANIA.**1.—Nutlets without ventral cavities.**

*Petioles short, glandless or with occasional minute glands; leaves obovate to oblong, oval or rarely ovate, cuneate at the base; corymbs many-flowered.

Leaves coriaceous, dark green and shining above, mostly quite glabrous, usually serrate only above the middle, their veins thin except on vigorous shoots and sometimes within the parenchyma; corymbs glabrous; fruit oblong to sub-

globose; nutlets 1-3, generally obtuse and rounded at the ends, prominently ridged on the back, . . . 1. CRUS-GALLI.
 Leaves membranaceous to subcoriaceous, mostly acute or occasionally rounded at the apex, their veins prominent; corymbs villose; fruit usually short-oblong, often conspicuously punctate; flesh dry and mealy; nutlets 2-5, prominently ridged on the back, . . . 2. PUNCTATÆ.

**Petioles elongated, usually slender (short and stout in Unifloræ), glandular only toward the apex (in Intricatæ sparingly glandular throughout).

Leaves mostly broad at the base.

Corymbs many-flowered (few-flowered in some species of Pruinosa).

Fruit subglobose to short-oblong, rarely pyriform, red or green, often slightly 5-angled, generally pruinose, especially during the summer; leaves blue-green, thin and firm to subcoriaceous, or rarely coriaceous,

3. PRUINOSÆ.

Fruit short-oblong to obovate, ovate or subglobose, red or scarlet, mostly lustrous, usually 1-1.5 cm. long; stamens 10 or less; anthers rose color, purple or red; leaves mostly membranaceous, hirsute on the upper surface while young, . . . 4. TENUIFOLIÆ.

Fruit subglobose, obovate or short-oblong, scarlet, 1.5-2 cm. long; flesh thick; nutlets thick, pointed at the ends, usually slightly ridged; corymbs tomentose; leaves membranaceous, broad, cuneate to rounded or cordate at the base, more or less pubescent below; stamens 10 or less; anthers white or pink, 5. MOLLES.

Fruit short-oblong to subglobose, 1.5-2 cm. long, scarlet, lustrous; flesh succulent; nutlets 3-5, grooved and occasionally ridged on back; corymbs slightly villose; leaves large, membranaceous, oblong, more or less acutely lobed; stamens 10 or less; anthers rose color,

6. FLABELLATÆ.

Leaves cuneate at the base (rarely broad in Intricatæ), subcoriaceous or membranaceous.

Corymbs many- or few-flowered, glabrous or villose; fruit subglobose, 9-12 mm. in diameter; leaves dark green and lustrous on their upper surface, . . . 7. COCCINÆÆ.

Corymbs usually few-flowered; fruit subglobose to short-oblong or obovate, 1-1.5 cm. long, greenish-yellow, orange color or red; nutlets 3-5, rounded at the ends, generally conspicuously ridged on the back,

8. INTRICATÆ.

Flowers solitary, or in 2 or 3-flowered simple corymbs; calyx lobes large and foliaceous; stamens 20; anthers pale yellow; leaves obovate, nearly sessile; small shrubs, . . . 9. UNIFLOREÆ.

- 2.—Nutlets with longitudinal cavities on their ventral faces; fruit pyriform to subglobose or short-oblong, 1–1.5 cm. in diameter lustrous, orange or scarlet; nutlets 2 or 3, usually obtuse at the ends, prominently ridged on the back, 10. *TOMENTOSÆ*.

I.—*CRUS-GALLI*.

Anthers rose color.

Primary veins within the parenchyma; leaves obovate-cuneiform, mostly rounded at the apex; stamens 10; fruit short-oblong, often covered with a glaucous bloom, 8–12 mm. long; nutlets 2, 1. *C. crus-galli*.

Primary veins without the parenchyma, thin but conspicuous.

Leaves obovate to oval, acute at the apex; stamens 15, fruit short-oblong, dull red covered with a glaucous bloom, 1.8–1.2 cm. long; nutlets 2, 2. *C. rivalis*.

Leaves oblong, cuneate to ovate or rarely obovate, acute or rarely rounded at the apex; stamens 10–13; fruit short-oblong to subglobose, dark crimson, lustrous, 1.2–1.5 cm. long; nutlets 3–5, 3. *C. canbyi*.

Anthers pale yellow.

Leaves obovate, acute, acuminate or rarely rounded at the apex, their primary veins mostly within the parenchyma; stamens 5–10, rarely 12; fruit short-oblong, 1–1.2 cm. long, dark dull crimson; nutlets 1 or 2, 4. *C. arduennæ*.

Leaves obovate-cuneate, short-pointed or rarely rounded at the apex, their primary veins very slender, mostly without the parenchyma; stamens 8–10; fruit subglobose, dark crimson, rather lustrous, 8–9 mm. in diameter; nutlets 1 or 2, 5. *C. bartramiana*.

1. *Cratægus crus-galli* Linnæus.

Spec. 476 (1753).—Sargent, *Silva N. Am.*, IV, 91, t. 178; *Man.* 368, f. 286.

Cratægus trahax Ashe, *Jour. Elisha Mitchell Sci. Soc.*, XIX, part I, p. 27 (1903). Gruber, *Proc. Berks County Nat. Sci. Club*, I, 21 (*Cratægus* in *Berks County*, II).

Berks county: North Heidelberg, *C. L. Gruber* (No. 61), 1901, May and September, 1903; (No. 105), 1902, May and August, 1903; Kutztown, *C. L. Gruber* (No. 45), 1902, August, 1903. Philadelphia county: Gray's Ferry, Philadelphia, *A. MacElwee* (No. 2,267, *Herb. Philadelphia Museums*), June, 1901; Haddington, *A. MacElwee* (No. 2,233A, *Herb. Philadelphia Museums*), June, 1901.

Cratægus trahax (Gruber, No. 45) appears to differ from common forms of *Cratægus crus-galli* only in its usually unarmed branchlets and small fruit. Gruber's No. 105 is, perhaps, the same.

Cratægus crus-galli var. *oblongata* Sargent.

Bot. Gazette, XXXV, 99 (*The Genus Cratægus* in New Castle County, Delaware); *Man.* 369.

Leaves slightly hairy on the upper side of the midribs while young,

becoming glabrous. *Fruit* oblong, often 2-5 centimeters in length, rather brighter-colored than those of the type; nutlets usually 1 or occasionally 2, acute at the ends, prominently or only slightly ridged on the dorsal side, 1-1.2 cm. long.

Bucks county: Durham, *C. D. Fretz* (No. 147A), September and October, 1901, September, 1902. Berks county: North Heidelberg, *C. L. Gruber* (No. 109), 1902, May and September, 1903. Also near Wilmington, Delaware.

Readily distinguished by the hairs on the upper side of the midribs of the young leaves, and by the larger oblong fruits usually with a single nutlet. Further investigation of this form may show that it should be considered a species.

***Crataegus crus-galli* var. *capellata* Sargent.**

Bot. Gazette, XXXV, 100 (The Genus *Crataegus* in New Castle County, Delaware) (1903); Man. 369.

Leaves oblong-obovate, rounded or acute at the apex. *Flowers* 8-10 mm. in diameter, in many-flowered slightly villose corymbs; stamens 7-10; anthers pale rose color; styles usually 1, rarely 2. *Fruit* subglobose to short-oblong, green, slightly blotched with red, 8-9 mm. in length.

Philadelphia county: Meadow at the head of the Wissahickon Drive, Germantown, *W. M. Canby*, May 24, 1902.

What appears an unusual form of *Crataegus crus-galli* has been found by Mr. Smith below Gray's Ferry in West Philadelphia (No. 248). It is a tree about 5 m. high, nearly destitute of thorns, with wide-spreading branches forming a round-topped head, oblong-obovate leaves acute, acuminate or rarely rounded at the apex, their veins more prominent than those of the leaves of ordinary forms of *Crataegus crus-galli*. Flowers 8-10 mm. in diameter in many-flowered glabrous corymbs; stamens 6-10; anthers pink; styles 1 or 2. The fruit I have not seen. The absence of thorns is remarkable in plants of this group.

2. *Crataegus rivalis* n. sp.

Leaves obovate to oval, acute at the apex, gradually narrowed and concave-cuneate at the base, and sharply usually simply serrate above the middle, with glandular teeth; nearly fully grown when the flowers open from the 20th to the 25th of May, and then villose, with long pale hairs on the upper side of the midribs and of the petioles, and at maturity glabrous, dark green and very lustrous on the upper and dull and paler on the lower surface, 4-5 centimeters long, 2-2.5 centimeters wide, with prominent yellow midribs and slender conspicuous veins without the parenchyma; their petioles slender, grooved, more or less

wing-margined toward the apex, becoming glabrous, occasionally furnished with minute glands; on vigorous shoots leaves oval, acute or abruptly acuminate, coarsely doubly serrate often nearly to the base, sometimes laterally divided into short acute lobes, 8-10 cm. long and 5-6 cm. wide, with stout petioles wing-margined nearly to the base, and foliaceous lunate coarsely serrate stalked petioles 1-1.5 cm. in length. *Flowers* 1.3-1.5 cm. in diameter, on slender pedicels, in compact glabrous corymbs, with caducous glandular bracts and bractlets; calyx-tube narrowly obconic, the lobes linear, acuminate, entire or occasionally glandular-serrate, sparingly villose on the inner surface below the middle; stamens 15; anthers rose color; styles 2 or 3, surrounded at the base by tufts of pale hairs. *Fruit* ripening toward the end of September in few-fruited drooping clusters, short-oblong, full and rounded at the ends, dull red covered with a glaucous bloom, 1-1.2 cm. long; calyx-cavity narrow, the lobes little enlarged, reflexed and closely appressed, villose above, often deciduous from the ripe fruit; nutlets narrowed at the apex, rounded at the base, very prominently ridged on the back, with a broad high grooved ridge, 8-10 mm. long and 5-6 mm. wide.

A bushy tree, with a short stout stem occasionally 30 cm. in diameter, covered with light red-brown scaly bark, stout ascending ashy-gray branches forming a broad open head, and stout branchlets glabrous, dull green and marked by numerous pale lenticels when they first appear, light orange or reddish-brown and very lustrous in their first winter, dull orange or dull gray-brown in their second year, and armed with numerous stout straight or slightly curved dark reddish-brown ultimately ashy-gray spines 2-3 cm. in length.

Bucks county: Meadows of Perkiomen creek, Sellersville, *C. D. Fretz* (Nos. 8, 24, 113), May, 1881, May, July, September and October, 1899.

Well distinguished from *Crataegus crus-galli* Linnaeus, by the shape of the acute leaves, their prominent veins, the hairs on the upper surface of the midribs, and especially by the shape of the large leaves of vigorous shoots, by the larger number of stamens and the earlier ripening of the fruit.

3. *Crataegus canbyi* Sargent.

Bot. Gazette, XXXI, 3 (1901); Silva N. Am., XIII, 41, t. 638; Man. 369, f. 287.

Bucks county: Point Pleasant, *C. D. Fretz* (No. 116), September, 1899; Tohikon, *C. D. Fretz* (No. 25), July 1, 1899. Delaware county: Tinicum, *B. H. Smith*, October, 1899, May and October, 1900 (No. 191b), May, 1902. Bucks county: Near Quakertown, *C. D. Fretz* (No.

120), October, 1889; meadows of Tohikon creek, Quakertown, *W. M. Canby*, May, 1900. Also in the hedge of old thorn trees bordering the lane leading to Bartram's Garden in West Philadelphia, where, judging by the size of these trees, it may have been planted by John Bartram himself; also in Delaware and Maryland.

4. *Cratægus arduennæ* Sarg.

Bot. Gazette, XXXV, 377 (1903); Man. 373, f. 291.

Berks county: Near Kutztown, *C. L. Gruber* (No. 145), 1902, August and October, 1903, June, 1904; also from southern Michigan to north-eastern Illinois.

5. *Cratægus bartramiana* n. sp.

Leaves obovate-cuneate, abruptly short-pointed or rarely rounded at the apex, gradually narrowed to the elongated slender base, coarsely and often doubly serrate above, with glandular teeth, nearly fully grown when the flowers open during the first week of June, and at maturity glabrous, dark green and lustrous on the upper, dull and paler on the lower surface, 2.5–4 cm. long and 1.5–2 cm. wide, with very slender primary veins mostly within the parenchyma; petioles slender, winged usually to below the middle, sometimes glandular, with occasional large dark glands, 6–7 cm. long; leaves of vigorous shoots obovate to oblong-obovate, usually short-pointed at the apex, coarsely serrate often to below the middle, 5–8 cm. long and 4–5 cm. wide, with linear lanceolate coarsely glandular-serrate deciduous stipules. *Flowers* about 8 mm. in diameter, on slender pedicels, in compound many-flowered corymbs, with linear slightly glandular caducous bracts and bractlets; calyx-tube narrowly obconic, the lobes elongated, linear, entire or rarely obscurely glandular-dentate; stamens 8–10; anthers pale yellow; styles 1 or 2, or rarely 3. *Fruit* ripening from the middle to the end of September, on stout pedicels, in drooping many-fruited clusters, subglobose but a little longer than broad, crimson, lustrous, marked by large dark dots, 8–10 mm. in diameter; calyx-cavity broad and shallow, the lobes enlarged, spreading, reflexed, entire or coarsely serrate and mostly persistent on the ripe fruit; nutlets 1 or 2, full and rounded at the ends, prominently ridged, with broad grooved ridges, about 7 mm. long and 5–6 mm. wide.

A tree 5–7 m. high, with a trunk 25–30 cm. in diameter, covered with dark red-brown scaly bark, stout spreading branches, and slender slightly zigzag dark dull red-brown branchlets armed with numerous stout straight purplish thorns 4–5 cm. long.

Hedgerow along the lane leading to Bartram's Garden, West Phila-

delphia, *A. MacElwee* (No. 2,270, Herb. Philadelphia Museums), June, 1901; *Canby* and *Sargent*, September, 1902; *Smith* and *Sargent*, October, 1904.

This species is named for John Bartram, the distinguished Pennsylvania botanist of the eighteenth century, by whom, perhaps, was planted the hedge of thorn trees in which it is growing.

II.—PUNCTATÆ.

Anthers rose color or yellow; stamens 20; leaves obovate, often acutely lobed above the middle, especially on vigorous shoots, more or less villose below; fruit on short pedicels, flattened at the ends, marked by large pale dots, dull red or bright yellow, . . . 1. *C. punctata*.

Anthers rose color; stamens 10–20; leaves oblong-obovate to oval, glabrous at maturity; fruit on elongated slender pedicels, occasionally slightly obovate, dark brick-red marked by large pale dots, . . . 2. *C. pausiaca*.

1. *Cratægus punctata* Jacquin.

Hort. Vind., I, 10, t. 28 (1770).—Sargent, *Silva N. Am.*, IV, 103, t. 184; Man. 389, f. 308.

Cratægus crocata Ashe, Ann. Carnegie Mus., I, 389 (1902).—Gruber, Proc. Berks County Nat. Sci. Club, I, 21 (*Cratægus* in Berks County, II).

Common in eastern Pennsylvania; also from the Province of Quebec to Illinois and through the northeastern States, and along the Appalachian Mountains, to North Carolina and Tennessee.

Cratægus crocata is the common yellow-fruited form which appears to be most abundant in the region adjacent to Lakes Ontario and Erie.

Cratægus punctata var. *canescens* Britton.

Bull. Torrey Bot. Club, XXI, 231 (1894).—Sargent, Man. 389.

Bucks county: Durham, *C. D. Fretz* (No. 153), May and September, 1901. Monroe county: Near Stroudsburg, *W. M. Canby*, May, 1903.

This is a form densely hoary-tomentose on the under surface of the leaves and on the pedicels and corymbs.

2. *Cratægus pausiaca* Ashe.

Ann. Carnegie Mus., I, 390 (so far as relates to Bucks county) (1902).—Sargent, Trees and Shrubs, I, 105, t. 53; Man. 390, f. 309.

Bucks county: Without locality, *W. W. Ashe*, June and October, 1900; Durham, *C. D. Fretz* (No. 147), May and October, 1901. Delaware county: Newtown, near Crum creek above the West Chester road, *B. H. Smith* (No. 192), May, September and October, 1901, May, 1902, *Smith* and *Sargent*, September, 1902; Lownes' Run, Springfield, *B. H. Smith* (No. 235), May and September, 1903; meadows near Chadsford, *W. M. Canby*, September, 1903.

III.—PRUINOSÆ.

Stamens 20.

Anthers rose color to pink or red.

Corymbs glabrous, fruit subglobose.

Corymbs many-flowered.

Leaves elliptical; fruit subglobose, green and pruinose when fully grown, becoming dark red and lustrous at maturity, 1.2–1.7 cm. in diameter; anthers large, light rose color,

1. *C. pruinosa*.

Leaves ovate, mostly rounded at the broad base; fruit hard and green, 1–1.2 cm. in diameter; anthers red,

2. *C. austera*.

Corymbs few-flowered.

Leaves ovate to elliptic; fruit depressed-globose, frequently swollen and mamillate at the middle, scarlet, often dark olive green toward the apex, 1.2–1.4 cm. in diameter; anthers light pink, 3. *C. bona*.

Leaves ovate.

Leaves cuneate at the base; fruit short-oblong to ovate, conspicuously 5-angled and mamillate below the middle, bright plum color, 1.3–1.4 cm. long, 4. *C. arcana*.

Leaves rounded to subcordate at the base; fruit depressed-globose, not mamillate below the middle, 1.7–2 cm. in diameter, light red; anthers pale pink,

5. *C. philadelphica*.

Leaves ovate to deltoid, usually rounded or truncate at the base; fruit short-oblong to subglobose, bright scarlet; anthers light rose color, 6. *C. felix*.

Corymbs villose; leaves slightly scabrate above.

Leaves ovate, villose below toward the base of the midribs and on the petioles; fruit short-oblong to subglobose, olive green, rarely with a rose-tinted cheek, 9–10 mm. in diameter; anthers light pink, 7. *C. virella*.

Leaves broadly ovate; villose on the midribs while young; fruit subglobose, retuse at the base, bright green until late in the season, turning scarlet, 1.2–1.4 cm. in diameter; anthers light red, 8. *C. ruthiana*.

Leaves oblong to elliptic, villose on the upper surface and on the base of the midribs while young; fruit depressed-globose, broader than high, bright green and lustrous until late in the autumn, ultimately becoming bright cherry red, 1.5–1.7 cm. in diameter, 9. *C. comata*.

Anthers pale yellow.

Leaves subcoriaceous.

Fruit short-oblong to ovate, dull green, 8–9 mm. long; leaves ovate, 10. *C. jejuna*.

Fruit globose to depressed-globose or round-ovate, deep dark red at maturity, 1–1.6 cm. in diameter.

Leaves broadly ovate to deltoid-ovate; arborescent, 5–6 m. high.

- Calyx-tube long; fruit dry and mealy, . . . 11. *C. uplandia*.
 Calyx-tube short; fruit bitter and acid, . . . 12. *C. callosa*.
 Leaves narrow-ovate to oblong-ovate; shrubby, usually
 2-5 m. high.
 Flowers about 1.2 cm. in diameter, in compact mostly
 4-7-flowered corymbs; fruit often obovate,
 . . . 13. *C. cestricea*.
 Flowers often 2 cm. in diameter, in lax 5-10-flowered
 corymbs, . . . 14. *C. augusta*.
 Fruit obovate, dull green tinged with red, 1-2 cm. long; leaves
 oblong-ovate, . . . 15. *C. insueta*.
 Leaves coriaceous, oblong-ovate to oval, acuminate and long-
 pointed, glabrous; fruit pyriform, sometimes becoming ob-
 long, dark crimson, 1-1.2 cm. long. . . . 16. *C. porteri*.
 Stamens 10 or less. Anthers pink, dark rose color or purple.
 Leaves smooth on the upper surface.
 Leaves ovate to rhombic, cuneate at the base; fruit depressed-
 globose, crimson, slightly pruinose, 1-1.2 cm. in diameter;
 anthers pale pink, . . . 17. *C. dissona*.
 Leaves rhombic or occasionally oblong-ovate, deeply laciniately
 lobed; fruit oblong to short-oblong, crimson, covered with a
 thick glaucous bloom, about 1.2 cm. long; anthers purple,
 . . . 18. *C. alacris*.
 Leaves oval to ovate, cuneate at the base; fruit short-oblong to
 ovate, conspicuously mamillate at the base, dull red, covered
 with a glaucous bloom, 1-1.2 cm. in diameter; anthers purple,
 . . . 19. *C. deducta*.
 Leaves scabrate on the upper surface; anthers dark rose color.
 Pedicels glabrous.
 Leaves ovate, as broad as long, truncate or rounded at the broad
 base; fruit depressed-globose, bright red, 1-1.2 cm. in
 diameter, . . . 20. *C. deltooides*.
 Leaves ovate, usually rounded or cuneate at the base; fruit obo-
 vate, greenish-red, with a crimson cheek, 1.2-1.5 cm. long,
 . . . 21. *C. fretzii*.
 Leaves ovate to rhombic, rounded or cuneate at the base; fruit
 obovate, orange red, 8-10 mm. long, . . . 22. *C. scabriuscula*.
 Pedicels villose; leaves ovate, usually rounded or truncate at the
 broad base, deeply lobed; fruit oblong to obovate, dull red,
 covered with a glaucous bloom, 1.4-1.5 cm. long,
 . . . 23. *C. delicata*.

1. *Cratægus pruinosa* K. Koch.

Verhandl. Preuss. Gart. Verein, neue Reihe, I. 246 (*Cratægus* und *Mespilus*)
 (1854).—Sargent, *Silva N. Am.*, XIII, 61, t. 648; *Man.* 411, f. 331.

Philadelphia county: Kingessing, *B. H. Smith* (No. 208), May, 1902,
 May and October, 1903, May, 1904. Berks county: Near West Lees-
 port, *C. L. Gruber* (No. 110), 1902, September, 1903, May and August
 1904; Forge Hill, North Heidelberg township, *C. L. Gruber* (No. 104)

1902, May and August, 1904. Also from southern Vermont to Illinois and Missouri and southern Virginia.

In Mr. Smith's specimens the anthers are lighter colored than in the Berks county and New England plants. The pedicels of the fruit of all the Pennsylvania specimens are much shorter and stouter than those of the tree figured in *The Silva of North America* and growing in the Arnold Arboretum, and the fruit is smaller.

2. *Crataegus austera* n. sp.

Leaves ovate, acute or acuminate, full and rounded or broadly or narrowly concave-cuneate at the base, coarsely doubly serrate, with straight glandular teeth, and divided above the middle into three or four pairs of narrow acuminate lateral lobes; when they unfold deep vinous red and glabrous with the exception of a few scattered caducous hairs above, almost fully grown when the flowers open about the 20th of May, and at maturity thin but firm in texture, dark blue-green on the upper, paler and yellowish-green on the lower surface, 4-6 cm. long and 3-4.5 cm. wide, or on vigorous shoots sometimes nearly as broad as long; petioles very slender, grooved on the upper side, glandular toward the apex, with occasional minute glands and 2-3 cm. long; stipules linear, glandular, deep red, caducous. *Flowers* 1.8-2 cm. in diameter, on slender elongated pedicels, in compact glabrous mostly 6- or 7-flowered corymbs, with oblanceolate glandular deep red conspicuous caducous bracts and bractlets; calyx-tube broadly obconic, the lobes slender, entire or sparingly dentate above the middle; stamens 20; anthers large, red; styles 3 to 5, surrounded at the base by a broad ring of pale tomentum. *Fruit* ripening very late and remaining hard, on long slender pedicels, in few-fruited clusters, subglobose, dull green or ultimately reddish, 1-1.2 cm. in diameter; calyx enlarged and prominent, with a broad deep cavity and erect or spreading mostly persistent lobes; flesh very thin, hard and dry, closely adhering to the nutlets; nutlets dark reddish-brown, full and rounded at the base, gradually narrowed to the acute apex, broadly ridged on the back, with a grooved ridge, nearly as long as the fruit and about 6 mm. wide.

A shrub 2.5-3 m. high with ascending stems, and slender slightly zigzag branchlets marked by small scattered pale lenticels, dull green to purplish when they first appear, rather bright reddish-brown during their first summer, becoming purplish during the following winter and dull gray-brown in their second year, and armed with numerous very slender nearly straight purplish spines 4-6 cm. in length.

Bucks county: *C. D. Fretz*, near Sellersville (No. 102), May and September, 1899; Hilltown (No. 124), May and September, 1900; Deep

Run, near Sellersville (No. 127, type!), May and September, 1900; Perkasio (No. 137), May and October, 1901; near Sellersville (No. 138), May and September, 1901.

A specimen collected by the late Prof. Porter on College Hill, Easton, Northampton county, September 15, 1893, and labelled *Cratægus coccinea* L., is probably of this species.

3. *Cratægus bona* n. sp.

Leaves ovate-oblong or occasionally rhombic, acuminate, usually full and rounded or rarely acute or truncate, or on vigorous shoots sometimes subcordate, at the entire base, finely doubly serrate above, with straight glandular teeth, and often slightly divided into 2 or 3 pairs of small acute lateral lobes, pale reddish-bronze when they unfold, more than half-grown when the flowers open about the 20th of May, and then membranaceous and glabrous with the exception of a few scattered caducous hairs on the base of the upper side of the midribs, and at maturity thin, dark bluish-green on the upper, pale on the lower surface, 3.5–4.5 cm. long and 2.5–3 cm. wide, with thin midribs and slender veins extending obliquely to the points of the lobes; petioles very slender, obscurely grooved on the upper side, slightly wing-margined at the apex, glandular at first, with scattered stipitate caducous glands, 2–2.5 cm. in length; stipules narrow, acuminate, falcate, conspicuously glandular, caducous. *Flowers* 1.6–1.8 cm. in diameter, on short slender glabrous pedicels, in small very compact 2–6-flowered simple corymbs, with comparatively large oblong-obovate to linear glandular caducous bracts and bractlets; calyx-tube broadly obconic, the lobes separated by wide sinuses, gradually narrowed from a broad base, short, acute or acuminate, entire or rarely obscurely toothed, tinged with red at the apex; stamens 20; anthers pink; styles 3–5, usually 4, surrounded at the base by a narrow ring of short pale hairs. *Fruit* ripening early in October, on short erect pedicels, usually in 1–4-fruited clusters, depressed-globose, often angular, sometimes swollen and acutely mamillate round the middle, slightly concave or flattened at the apex, retuse at the base, scarlet, frequently dark olive-green or spotted with russet or orange toward the apex, covered with a glaucous bloom, 1.2–1.4 cm. in diameter and 1–1.1 cm. high; calyx enlarged, with a short tube, a broad deep cavity and spreading and closely appressed lobes red on the upper side below the middle and mostly persistent on the ripe fruit; flesh thin, firm, yellow or greenish-yellow, dry and mealy; nutlets usually 4.

A shrub, sometimes 3–4 m. high, with numerous ascending to semi-erect slender flexuose stems covered with dark gray or nearly black

scaly bark, and slender nearly straight branchlets marked by occasional pale lenticels, dull red-brown and covered with a glaucous bloom when they first appear, becoming lustrous and dull gray-brown in their second year, and armed with few slender nearly straight purplish-brown spines usually 3–6 or occasionally only 1–2 cm. in length, often becoming compound on old stems.

Berks county: Gravelly limestone bluffs along Tulpehocken creek, North Heidelberg township, *C. L. Gruber* (No. 106, type!), 1902, May, August and September, 1904.

4. *Cratægus arcana* Beadle.

Bilt. Bot. Studies, I, 122 (1902); Small, Fl. S. E. States, 564.—Sargent, Bot. Gazette, XXXV, 101 (The Genus *Cratægus* in New Castle County, Delaware).

Berks county: Limestone bluffs, Tulpehocken creek, North Heidelberg township, *C. L. Gruber* (No. 151), 1902, May, August and September, 1903. Bucks county: Near Sellersville, *C. D. Fretz* (Nos. 126, 141), May, 1898, October, 1899, May and September, 1900, May, 1901. Delaware county: Preston Run Barrens, Newtown, *B. H. Smith* (No. 229), May and October, 1903; near Chadsford, *B. H. Smith* (No. 196), May and September, 1902; *W. M. Canby*, October 8, 1902. Also northern Delaware to the elevated regions of western North Carolina.

A shrubby species common in eastern Pennsylvania, with thin cuneate leaves except on vigorous shoots, and fruits obconic at the base and conspicuously swollen or mamillate below the middle.

5. *Cratægus philadelphica* n. sp.

Leaves ovate, acute or acuminate, full and rounded or subcordate at the broad entire base, sharply doubly serrate above, with straight glandular teeth, and divided above the middle into 3 or 4 pairs of small acute spreading lobes, more than half-grown when the flowers open about the 10th of May and then membranaceous, light yellow-green and sparingly villose above, especially on the midribs and veins, pale and glabrous below, and at maturity subcoriaceous, dark dull blue-green on the upper, pale bluish-green on the lower surface, 4–4.5 cm. long and 3.5–4 cm. wide, with stout midribs and usually 4 pairs of thick primary veins arching obliquely to the points of the larger lobes; petioles stout, abruptly wing-margined at the apex, grooved on the upper side, glabrous, only occasionally glandular and 1.5–2 cm. in length; stipules linear, acuminate, coarsely glandular, fading red, caducous; leaves on vigorous shoots often broader than long and cordate or truncate at the base. *Flowers* 2 cm. in diameter, on slender glabrous pedicels, in compact few, usually 5–7-flowered corymbs; calyx-tube broadly ob-

conic, glabrous, the lobes gradually narrowed from wide bases, acuminate, entire with slightly undulate margins, or occasionally furnished with 1 or 2 teeth near the middle, reflexed after anthesis; stamens 16–20; anthers pale pink; styles usually 5, surrounded at the base by a conspicuous ring of long white hairs. *Fruit* ripening from the first to the middle of October, on short stout erect pedicels, in mostly 3–5-flowered clusters, depressed-globose, full and rounded at the base, more or less angled, green and lustrous until late in the season, marked by many large dark dots, becoming finally light red, 1.7–2 cm. in diameter and 1.5 cm. high; calyx much enlarged, without a tube and with a broad deep cavity, and spreading often incurved lobes slightly and irregularly serrate particularly toward the apex, red on the upper side below the middle, and mostly deciduous from the ripe fruit; flesh thick, pale yellow, dry and mealy; nutlets 3–5, usually 5, full and rounded at the ends, prominently ridged on the back, with a broad deeply grooved ridge, about 7 mm. long and 4 mm. wide.

A broad shrub, with numerous erect stems 3–4 m. high, and slender nearly straight branchlets marked by many pale lenticels, dark red-brown and covered with a glaucous bloom when they first appear, darker and very lustrous during their first winter, dark gray-brown the following year and armed with nearly straight slender red-brown lustrous spines 3.5–5 cm. in length.

Philadelphia county: Island road, Kingsessing, West Philadelphia, *B. H. Smith* (No. 194, type!), May and September, 1901; *Smith and Sargent*, September, 1902.

6. *Cratægus felix* n. sp.

Leaves ovate to deltoid, acuminate, rounded, truncate or rarely concave-cuneate at the entire or glandular base, sharply doubly serrate above, with straight gland-tipped teeth, and deeply divided into 3 or 4 pairs of narrow acuminate lobes, more than half-grown when the flowers open from the 10th to the 15th of May and then very thin, bright yellow-green, slightly hairy and scabrate above, soon becoming smooth and glabrous, and pale or glaucous and glabrous below, and at maturity thin and firm in texture, dark yellow-green on the upper and pale on the lower surface, 3–5 cm. long, 2–5 cm. wide, and often rather broader than long, with slender yellow midribs, and thin primary veins arching obliquely to the points of the lobes; petioles slender, grooved on the upper side, slightly wing-margined at the apex, glandular, with minute persistent glands, glabrous, 1–1.5 cm. in length; leaves on vigorous shoots broadly ovate, rounded to subcordate at the base, coarsely serrate, usually deeply divided into broad acuminate lateral lobes,

sometimes 6–7 cm. long and wide, with stout broadly winged coarsely glandular petioles. *Flowers* 1.7–2 cm. in diameter, on slender glabrous pedicels, in 3–8-flowered simple corymbs, with small linear acuminate glandular bracts and bractlets, fading brown; calyx-tube narrowly obconic, glabrous, the lobes slender, acuminate, entire or slightly toothed near the middle, reflexed after anthesis; stamens 18–20; anthers light rose color; styles 3–5. *Fruit* ripening about the 20th of September, on slender pedicels, in usually 4- or 5-flowered compact drooping clusters, short-oblong to subglobose, often slightly tapering at the base, bright scarlet, rarely blotched with russet, covered with a glaucous bloom, finally becoming very lustrous, 1.2–1.5 cm. in diameter; calyx little enlarged, closely appressed, with a broad shallow cavity and slender reflexed persistent lobes, dark red on the upper side toward the base; flesh firm, light orange color sometimes tinged with red; nutlets 3 or 4, gradually narrowed and rounded at the base, acute at the apex, slightly and irregularly ridged on the back, 7–8 mm. long and 5–6 mm. wide.

A broad compact bush 2–3 m. high, with numerous erect flexuose stems covered with dark gray bark and slender nearly straight glabrous branchlets marked by oblong pale lenticels, light orange color tinged with red and slightly glaucous when they first appear, becoming light reddish or chestnut-brown in their first winter, and ashy-gray the following year, and armed with numerous stout nearly straight or slightly reflexed bright chestnut-brown or purplish spines 2.5–3 cm. in length.

Berks county: Dry open stony fields east of Reading; common; *C. L. Gruber* (No. 112, type!), August and September, 1904, May, 1905.

7. *Cratægus virella* Ashe.

Annals Carnegie Mus., I, pt. 3, 396 (1902).—Gruber, Proc. Berks County Nat. Sci. Club, I, 15 (*Cratægus* in Berks County, II).

Leaves ovate, acuminate, cuneate or rounded at the entire base, sharply doubly serrate above, with slender spreading or incurved teeth, and divided into numerous small acuminate spreading lobes, more than half-grown when the flowers open from the 15th to the 20th of May and then membranaceous, bluish-green and villose above, with short pale deciduous hairs and below along the base of the midribs with long spreading hairs, and at maturity thin but firm, dark blue-green and slightly roughened on the upper and pale and still villose on the slender midribs below, 3.5–4.5 cm. long, 2–4 cm. wide, with 3 or 4 pairs of primary veins extending obliquely to the points of the largest lobes; petioles slender, abruptly and often broadly wing-margined at the apex, villose while young, with long matted hairs, becoming glabrous, glandu-

lar, with occasional minute caducous glands, and 1.5–2.5 cm. in length; stipules linear, acuminate, glandular, caducous; leaves on leading shoots broadly ovate, rounded or cuneate at the base and decurrent on the stout petioles, more coarsely serrate and more deeply lobed, villose on the under side of the midribs and veins and often 5.5–6 cm. long and 5 cm. wide. *Flowers* 1.5–1.7 cm. in diameter, on elongated slender slightly villose pedicels, in mostly 5- or 6-flowered compact villose corymbs, with linear acuminate glandular bracts and bractlets, fading brown and mostly persistent until after the petals have fallen; calyx-tube narrowly obconic, glabrous, the lobes gradually narrowed from broad bases, acuminate, sharply glandular-serrate above the middle, reflexed after anthesis; stamens 17–20; anthers pink; styles 3–5, surrounded at the base by a broad ring of matted pale hairs. *Fruit* ripening about the first of October, on slender erect glabrous or occasionally slightly villose pedicels, depressed-globose, olive-green rarely with a rose-flushed cheek, 9–10 mm. in diameter; flesh thin, dry and hard; calyx enlarged and prominent, without a tube and with a wide deep cavity, and small reflexed and closely appressed lobes dark red on the upper side toward the base and mostly persistent on the ripe fruit; nutlets 3–5, thick, rounded at the ends, irregularly ridged on the back, often with a high grooved ridge, 6–7 mm. long and about 4 mm. wide.

A shrub 3–5 m. high, spreading into broad thickets, with many erect stems, and slender nearly straight branchlets marked by many small pale lenticels, reddish-brown and slightly villose when they first appear, soon glabrous, dull red-brown in their first season, and dark brown tinged with red the following year, and armed with numerous very slender straight or slightly curved red-brown or purple spines often 6–7 cm. in length.

Berks county: Common; near Kutztown, *C. L. Gruber* (Nos. 36 and 132), 1901, May and September, 1902, 1903, 1904.

8. *Crataegus ruthiana* n. sp.

Leaves ovate, acuminate, full and rounded or abruptly concave-cuneate at the base, finely often doubly serrate, with straight glandular teeth, and divided above the middle into several short acuminate lateral lobes, dark vinous red, and covered with long caducous hairs when they unfold, more than half-grown when the flowers open the middle of May and then scabrate and slightly hairy along the midribs above and sparingly villose below at the junction of the midribs and veins, and at maturity glabrous, subcoriaceous, blue-green and still rough on the upper, paler and yellow-green on the lower surface, 4–7 cm.

long and 3–5 cm. wide, their petioles grooved, at first very slender and villose, becoming stouter and glabrous, glandular, with minute scattered deciduous glands, 1.5–2 cm. long; leaves on vigorous shoots more broadly ovate, truncate, slightly cordate or sometimes cuneate at the base, more coarsely serrate and more deeply lobed, and often 7–9 cm. long and wide, with stout broadly winged petioles, and foliaceous lunate coarsely glandular-serrate persistent stipules. *Flowers* about 1.5 cm. in diameter, on slender villose pedicels, in compact mostly 5–7-flowered villose corymbs, with oblanceolate glandular caducous bracts and bractlets; calyx-tube narrowly obconic, the lobes narrow, acuminate, glabrous, entire or sparingly glandular-serrate; stamens 20; anthers small, pale rose color; styles 3 to 5. *Fruit* on stout glabrous pedicels, in erect clusters, bright apple-green, and lustrous until October, later turning red, 1 cm. in diameter and rather broader than high, and retuse at the insertion of the pedicels; calyx prominent with a deep narrow cavity, and spreading closely appressed lobes dark red on the upper side below the middle; nutlets 3 to 5, usually 4, rounded at the gradually narrowed ends, irregularly and often only slightly ridged on the rounded back, 6–7 mm. long, and 5 mm. wide.

An arborescent shrub sometimes 5 meters high, with dark gray stems, and stout nearly straight branchlets marked by numerous small pale lenticels, light olive-green when they first appear, becoming dark red-brown tinged with red the following year, and armed with numerous stout or slender nearly straight purple spines 4–5 cm. in length.

Bucks county: Limestone bluffs, Durham, *C. D. Fretz* (No. 150, type! and 149), May, September and October, 1901; *Fretz and Sargent*, September, 1902.

No. 149 differs from the type in the rather smaller fruit and narrower leaves.

This species is named for the late Harvey F. Ruth, of Durham, an excellent botanist familiar with the plants of Durham and its vicinity.

9. *Cratægus comata* n. sp.

Leaves oblong-ovate to rhombic or broadly ovate on leading shoots, acuminate, rounded or broadly or acutely concave-cuneate at the entire base, sharply doubly serrate above, with straight glandular teeth, and divided into 3 or 4 pairs of short acuminate spreading lobes, when the flowers open about the first of May membranaceous, yellow-green, sparingly villose above and on the midribs below, 5–6 cm. long and 3–4 cm. wide; petioles slender, slightly wing-margined at the apex, villose, with long matted hairs, glandular, with occasional minute stipitate glands and 1.5–2.5 cm. in length; mature leaves not seen.

Flowers 1.6–1.7 cm. in diameter, on long densely villose pedicels, in compact 4–6-flowered hairy corymbs, with linear glandular caducous bracts and bractlets; calyx-tube narrowly obconic, glabrous, the lobes elongated, acuminate, entire or sparingly serrate above the middle; stamens 20; anthers pale pink; styles 3–5, surrounded at the base by a narrow ring of pale hairs. *Fruit* ripening the middle of October, on slender pedicels, in drooping few-fruited clusters, depressed globose, bright green and lustrous until late in the season, finally becoming light cherry red, about 1.6 cm. in diameter and 1.1 cm. in height; calyx little enlarged, without a tube and with a deep narrow cavity and spreading lobes mostly persistent on the ripe fruit; flesh firm, white or yellow; nutlets usually 3 or 4, full and rounded or acute at the apex, broadly ridged on the back, with a high usually grooved ridge, about 6 mm. long and 4 mm. wide.

A broad shrub 3–4 m. high, with numerous stems, and slender zigzag branchlets marked by small pale lenticels, light reddish-brown and pubescent when they first appear, soon glabrous, light reddish-brown and lustrous during their first winter and darker and purplish the following year, and armed with numerous slender straight slightly curved purple spines 4–5 cm. in length.

Philadelphia county: Below Gray's Ferry, and Angora, *B. H. Smith* (No. 241, type!), November 19, 1902, May, 1904.

10. *Cratægus jejuna* n. sp.

Leaves ovate to oval, acuminate, abruptly or acutely concave-cuneate or rounded at the entire base, finely doubly serrate above, with straight glandular teeth, and slightly divided into numerous short acute lateral lobes, half-grown when the flowers open about the 25th of May and then membranaceous, yellow-green and glabrous with the exception of a few caducous hairs along the upper side of the midribs, and at maturity subcoriaceous to coriaceous, dark blue-green and smooth on the upper, paler on the lower surface, 4.5–5.5 cm. long and 3–4 cm. wide, with stout midribs deeply impressed on the upper side and 4 or 5 pairs of slender primary veins arching obliquely to the points of the larger lobes; petioles sparingly villose at first, soon glabrous, stout, grooved on the upper side, slightly wing-margined at the apex, and 2.5–3 cm. long; leaves on vigorous shoots mostly truncate at the broad base, more coarsely serrate and more deeply lobed, often 5 cm. long and broad, with stout conspicuously glandular petioles. *Flowers* about 1.6 cm. in diameter, on long slender pedicels, in compact usually 5–7-flowered corymbs, with linear glandular bracts and bractlets often deciduous before the flowers open; calyx-tube broadly obconic, the lobes wide,

acuminate, entire or occasionally glandular-toothed, tipped with dark glands, reflexed after anthesis; stamens 20; anthers pale yellow; styles 3-5, surrounded at the base by a narrow ring of pale tomentum. *Fruit* ripening at the end of October, on stout pedicels, in few-fruited clusters, short-oblong to ovate, angled, dull green, hard and dry, 8-9 mm. long; calyx very prominent, with a long tube, a deep narrow cavity, and lobes reflexed and deciduous from the ripe fruit; flesh thin, dry and yellow; nutlets usually 4 or 5; bright red-brown, narrowed and acute at the ends, ridged on the back, with a high doubly grooved ridge, 6-7 mm. long and about 4 mm. wide.

An arborescent shrub 3-5 mm. high, with numerous erect stems sometimes forming thickets and slender only slightly zigzag branchlets marked by occasional large pale lenticels, dark orange-green when they first appear, soon becoming purplish, bright reddish-brown and lustrous in their first winter and dull dark red-brown the following year, and armed with stout straight purple spines 3-4 cm. in length.

Bucks county: Dry hillsides near Sellersville, *C. D. Fretz* (Nos. 145, type!, 127, 136 and 181), May and October, 1901.

In No. 181 the fruit is described by Dr. Fretz as "greenish or slightly red." The fruit of No. 136, which is 1.1-1.2 cm. in diameter, is described by him as "dark red with a bloom." This last number may prove distinct.

11. *Crataegus uplandia* n. sp.

Leaves broadly ovate, acute, full and rounded, truncate or abruptly cuneate at the wide entire base, slightly doubly serrate above, with straight glandular teeth, and divided into 4 or 5 pairs of short acute lateral lobes, when they unfold yellow-bronze color and sparingly villose on the midribs and veins below, more than half-grown when the flowers open about the 20th of May and then membranaceous and very smooth on the upper and paler on the lower surface, light yellow-green and glabrous with the exception of occasional tufts of short caducous pubescence in the axis of the primary veins below, and at maturity subcoriaceous, dull dark blue-green, 4-5 cm. long and 3.5-4.5 cm. wide, with stout yellow midribs and 4 or 5 pairs of slender primary veins arching obliquely to the points of the lobes; petioles slender, grooved on the upper side, slightly wing-margined at the apex, glandular, with occasional minute glands, and 2-2½ cm. in length; on vigorous shoots leaves ovate-deltoid, truncate to subcordate at the base, more deeply lobed, the sinuses of the lowest lobes often extending more than half way to the midribs, and 5-6 cm. long and broad, with stout conspicuously glandular petioles broadly wing-margined below the middle and

1.5–2 cm. long, and foliaceous lunate sharply serrate persistent stipules. *Flowers* 1.8–2 cm. in diameter, on stout elongated glabrous pedicels, in mostly 5–9-flowered compact corymbs with linear acute glandular bracts and bractlets generally caducous before the petals fall; calyx-tube narrowly obconic, the lobes slender, acuminate, nearly entire, or serrate sometimes to the base, reflexed after anthesis; stamens 20; anthers pale yellow; styles 4 or 5, surrounded at the base by a few pale hairs. *Fruit* in few-fruited spreading clusters, subglobose to short-oblong or slightly obovate, dark deep red marked by large pale dots, about 1.4–1.5 cm. in diameter; calyx prominent, with a long tube, a narrow deep cavity, and reflexed lobes, their tips mostly deciduous from the ripe fruit; flesh yellow, thin, hard, dry and mealy; nutlets 4 or 5, bright red-brown, full and rounded at the ends or narrowed and acute at the apex, prominently but very irregularly ridged and grooved on the back, 6–7 cm. long and about 5 mm. wide.

A tree sometimes 6 m. high, with a trunk 2.5 cm. in diameter, covered with dark gray-brown bark separating into thin plate-like scales, small spreading branches forming a round-topped head, and slender nearly straight branchlets, dark yellow-green tinged with red and covered with a glaucous bloom when they first appear, bright red-brown and marked with small pale lenticels during their first season, darker brown and rather lustrous the following year, and armed with slender nearly straight bright red-brown shining spines 3–5 cm. in length, sometimes becoming on old stems 10–12 cm. long and furnished with numerous stout branches.

Delaware county: Upper Darby, near the State road, *B. H. Smith* (No. 195, type!), May and October, 1901, May, 1902, May, 1903, *Smith* and *Sargent*, September, 1902; *B. H. Smith*, Crum Creek, Newtown (No. 234), May, 1903.

12. *Cratægus callosa* n. sp.

Leaves broadly ovate to deltoid-ovate or rarely oval, acute or acuminate, rounded or occasionally truncate at the entire base, coarsely doubly serrate above, with straight glandular teeth and slightly divided into numerous small acuminate lateral lobes, red-bronze and slightly pubescent near the base of the upper side of the midribs when they unfold, about half-grown when the flowers open about the 20th of May and then membranaceous, yellow-green and nearly glabrous, and at maturity thin but firm in texture, dark bluish-green on the upper and paler on the lower surface, 4.5–8 cm. long and 4–7 cm. wide, or on vigorous shoots often rather larger, with thin orange-colored midribs and slender primary veins extending obliquely to the points of the lobes,

turning yellow or greenish-yellow in the autumn and falling during the latter half of October; petioles slender, grooved on the upper side, abruptly wing-margined at the apex, glabrous, glandular, with minute stipitate dark caducous glands, 1.5–2.2 cm. in length; stipules linear to lanceolate, often falcate, usually lobed at the base, glandular-serrate, fading red or yellow, caducous. *Flowers* 1.7–2.5 cm. in diameter, on glabrous pedicels 1–2 cm. long, in 3–10 usually about 6-flowered compact corymbs, with oblong-obovate linear conspicuously glandular bracts and bractlets often persistent until after the flowers open; calyx-tube broadly obconic, the lobes separated by wide sinuses, narrow, acuminate, sometimes glandular, or rarely slightly serrate above the middle, reflexed after anthesis; stamens 20; anthers pale yellow; styles 3–5, usually 4 or 5. *Fruit* ripening late in October or in November and often retaining its color on the ground until the following spring, in 1–6-flowered clusters, globose or depressed-globose, slightly retuse at the base, rounded or slightly concave at the apex, remaining green until October, when fully ripe dark red to cardinal and usually blotched with dark olive-green or russet, punctate with greenish or russet dots and covered with a slight glaucous bloom, 1.3–1.6 cm. in diameter and 1.2–1.5 cm. high; calyx enlarged and prominent, with a short tube, a broad deep cavity and erect or spreading lobes dark red on the upper side toward the base, mostly persistent on the ripe fruit; flesh greenish, firm, bitter, acid; nutlets usually 4 or 5, rounded at the ends, rounded and ridged on the back, with a low slightly grooved ridge, 6–8 mm. long and about 4 mm. wide.

A tree occasionally 5 m. high, with a stem sometimes 1 m. long and 10–15 cm. in diameter, covered with dark gray-brown scaly bark, stout horizontal or semierect flexuose olive-gray branches forming a round-topped head, and slender nearly straight branchlets marked by occasional large oblong pale lenticels, dark reddish-brown when they first appear and darker and purplish during their first winter, and armed with numerous stout straight or slightly curved orange-brown ultimately purplish or nearly black spines 2.5–6 cm. in length, and on old stems much branched and sometimes 10 cm. long.

Berks county: Border of woods in high rocky ground, North Heidelberg township, *C. L. Gruber* (Nos. 159, type! and 176), May, September and October, 1902, 1903 and 1904.

13. *Cratægus cestricea* n. sp.

Glabrous. *Leaves* ovate, acute, broadly concave-cuneate and mostly entire or glandular, with stipitate bright red glands at the base, sharply doubly serrate above, with straight glandular teeth, and slightly divided

above the middle into three or four pairs of slender acute lobes, slightly tinged with red when they unfold, nearly fully grown when the flowers open about the middle of May, and at maturity thin but firm in texture, dark blue-green and lustrous on the upper, pale yellow-green on the lower surface, 3.5–4.5 cm. long and 3–3.5 cm. wide, with stout midribs and four or five pairs of prominent primary veins; petioles slender, slightly wing-margined toward the apex, glandular, with conspicuous usually persistent glands, and 1.5–2 cm. in length; stipules linear, acuminate, coarsely glandular, fading red, caducous; leaves on vigorous shoots full and rounded or nearly truncate at the broad base, more deeply lobed and more coarsely serrate, and often 5–6 cm. long and broad, with stout margined petioles 2–2½ cm. in length. *Flowers* about 1.2 cm. in diameter, on slender pedicels, in very compact 4–7-flowered corymbs, with conspicuous oblanceolate glandular pectinate bracts and bractlets; calyx-tube broadly obconic, the lobes gradually narrowed from broad bases, acuminate, entire or obscurely serrate above the middle; stamens 20; anthers small, pale yellow; styles 4 or 5, surmounted at the base by a narrow ring of short pale hairs. *Fruit* ripening about the middle of October on stout pedicels, in erect few-fruited clusters, subglobose to obovate, dark crimson, lustrous, marked by numerous small dark dots, 1.2–1.5 cm. long; calyx enlarged and prominent, without a tube and with a broad deep cavity, and short acute lobes coarsely and irregularly serrate above the middle, with occasional large teeth; flesh thick, dry and mealy, white slightly tinged with pink; nutlets 4 or 5, gradually narrowed and acute at the ends, prominently ridged on the back, with a wide deeply grooved ridge, about 6 mm. long and 4 mm. wide.

A pyramidal shrub 2.5–3 m. high, with numerous small erect stems, and slender slightly zigzag branchlets marked by occasional large pale lenticels, dark orange-green when they first appear, becoming light red-brown and very lustrous during their first summer and dull and darker red-brown the following year, and armed with many slender straight or slightly curved purple lustrous spines 4–6 cm. long.

Delaware county: Preston Run Barrens, Newtown, *B. H. Smith* (No. 204, type!), May 15, 1902, May 9, 1903; *Smith and Sargent*, September, 1902; *B. H. Smith* (No. 217), September, 1902, May, 1903 and 1904; *Smith and Sargent*, September, 1902.

14. *Crataegus angusta* n. sp.

Glabrous. *Leaves* narrowly ovate to oblong-ovate, acuminate, broadly cuneate or rounded at the entire base, coarsely doubly serrate above, with straight glandular teeth, and divided into 3 or 4 pairs of

short broad acute lateral lobes, when they unfold bronze-red and glandular with the exception of a few hairs in the axils of the veins below, nearly half-grown when the flowers open the middle of May and then membranaceous, dark yellow-green above and pale below, and at maturity subcoriaceous, dark blue-green and lustrous on the upper and paler or glaucous on the lower surface, 6-7 cm. long and 4-5 cm. wide, with thin yellow midribs and slender primary veins extending obliquely to the points of the lobes; turning dull yellowish-bronze or purplish-bronze before falling from the first to the middle of October; petioles slender, grooved on the upper side, slightly wing-margined at the apex, glandular at first, with minute stipitate dark red deciduous glands, 1.5-3 cm. in length; stipules ovate to lanceolate, often falcate, glandular, fading yellow or orange, caducous; leaves on vigorous shoots more broadly ovate, cordate, truncate or rounded at the broad base, 6-7 cm. long and wide, with stouter glandular petioles 1.5-2 cm. in length. *Flowers* 1.8-2.5 cm. in diameter, on slender glabrous pedicels 1.2-3.2 cm. long, in lax 5-10-flowered corymbs, with linear to lance-linear glandular bracts and bractlets conspicuous and persistent until after the petals fall; calyx-tube narrowly obconic, the lobes broad, acute or acuminate, entire or sparingly serrate above the middle, reflexed after anthesis; stamens 18-20; anthers pale yellow; styles 2-5, usually 3 or 4. *Fruit* ripening late in September or early in October, on stout erect pedicels, in 3-5-fruited clusters, pyriform until nearly fully grown, becoming depressed-globose or globose, angled, slightly concave at the ends, red or crimson, frequently blotched with dark olive-green and usually greenish at the apex, covered with a thick glaucous bloom, about 1-1.4 cm. in diameter and 9-10 mm. high; calyx prominent with a short tube, a wide shallow cavity, and much enlarged spreading or appressed lobes mostly persistent on the ripe fruit; flesh thin, dry and mealy; nutlets 3 or 4, pale green or yellowish-green, hard, usually rounded at the ends, irregularly ridged on the back, with a low usually broad grooved ridge, 6-7 mm. long and 4-5 mm. wide.

A slender treelike shrub 2.5-3 m. high, with few long slender flexuose ascending or semierect branches frequently forming an oblong head, and slender nearly straight branchlets marked by numerous large pale lenticels, purplish and covered when they first appear with a glaucous bloom, red-brown and lustrous in their second season and dark dull gray-brown the following year, and armed with slender nearly straight or slightly curved purplish or ultimately dark brown spines 4-6 cm. in length.

Berks county: Borders of woods and open thickets, near Kutz-

town, *C. L. Gruber* (No. 160, type!), 1902, May, August and October, 1903.

15. *Crataegus insueta* n. sp.

Glabrous. *Leaves* oblong-ovate, acuminate, full and rounded at the entire base, sharply doubly serrate above, with straight glandular teeth and slightly divided into 2 or 3 pairs of short acute lateral lobes, faintly tinged with red or bronze color when they unfold, nearly half-grown when the flowers open from the 12th to the 20th of May and then dark yellow-green and very lustrous above and paler and dull below, and at maturity subcoriaceous, very dark blue-green on the upper and paler and yellow-green on the lower surface; 4-5 cm. long, 2.5-3 cm. wide, with slender midribs and 4 or 5 pairs of inconspicuous primary veins; petioles slender, grooved on the upper side, glandular, with numerous scattered glands, 1.5-2 cm. in length; stipules linear, acuminate, glandular or furnished with occasional minute glands, bright pink like the conspicuous accrescent inner bud-scales; leaves on vigorous shoots often cordate at the base, sometimes deeply divided into broad lateral lobes, 5-6 cm. long and 4-5 cm. wide, with rather thicker petioles 1.5-2 cm. in length. *Flowers* 1.4-1.6 cm. in diameter, on long slender pedicels, in 5-8 usually 5-flowered corymbs, with linear caducous bracts and bractlets, the lower peduncles 1-flowered from the axils of upper leaves; calyx-tube narrowly obconic, the lobes narrow, elongated, acuminate, entire or sparingly glandular-serrate above the middle, strongly reflexed after anthesis; stamens 20; anthers white faintly tinged with yellow; styles 5. *Fruit* ripening late in October, pyriform, dull green tinged irregularly with red, becoming dull red in drying, 1-1.2 cm. long, 9-10 mm. broad above the middle, gradually narrowed to the base; calyx little enlarged, without a tube, with a broad shallow cavity, and small reflexed and closely appressed lobes gradually narrowed from broad bases; flesh thin, yellowish-green, dry and hard; nutlets 5, thin, tapering to the acute ends, irregularly ridged on the back, usually with a broadly grooved ridge, about 6 mm. long and 4-5 mm. wide.

A bushy tree, with a short stout trunk about 2 cm. in diameter, stout spreading ascending branches forming a broad shapely head, and slender only slightly zigzag branchlets marked by numerous small dark lenticels, orange-green and slightly tinged with red when they first appear, bright chestnut-brown and very lustrous during their first season and darker the following year, and armed with many stout nearly straight spines 3-4 cm. in length.

A single tree on the lawn near the lake in West Fairmount Park, Philadelphia, of unknown origin but probably planted, certainly an

eastern American species, and possibly indigenous. *Alexander MacElwee* (No. 2,165A, Herb. Philadelphia Museums), May and June, 1901; *Canby and Sargent*, September, 1902; *Smith and Sargent*, October, 1904.

16. *Crataegus porteri* Britton.

Bull. N. Y. Bot. Gard., I, 448 (1900); Torrey, IV, 39 (1904).

Glabrous. *Leaves* oblong-ovate to oval, long-pointed and acuminate at the apex, concave-cuneate and often unsymmetrical or full and rounded at the entire base, finely doubly serrate above, with straight or slightly incurved teeth, and divided above the middle into 4 or 5 pairs of short acute lobes, tinged with red when they unfold, about half-grown when the flowers open the middle of May and then membranaceous, light yellow-green above, and rather paler below, and at maturity coriaceous, dark blue-green and very lustrous on the upper and dull or pale blue-green on the lower surface, 6-7 cm. long and 3.5-5 cm. wide, with stout yellow midribs and slender primary veins extending obliquely to the points of the lobes, turning dull vinous red in the autumn; petioles slender, grooved on the upper side, slightly wing-margined at the apex, sparingly glandular, with minute deciduous glands, and 2-3 cm. in length; stipules linear, glandular, fading brown, caducous. *Flowers* 1-1.2 cm. in diameter, on slender elongated pedicels, in mostly 5-7-flowered lax corymbs, with linear to oblong-obovate glandular bracts and bractlets persistent until after the petals fall; calyx narrowly obconic, the lobes narrow, elongated, acuminate, entire, tipped with minute dark glands, reflexed after anthesis; stamens 20; anthers small, pale yellow; styles 3 or 4. *Fruit* ripening early in October, on slender pedicels, solitary or in few-fruited clusters, pyriform, sometimes becoming short-oblong when fully mature, dark crimson marked by small dark dots, 1-1.2 cm. long and 9-10 mm. wide; calyx not greatly enlarged, with a short tube, a broad deep cavity, and closely appressed lobes mostly persistent on the ripe fruit; flesh yellow, dry and mealy; nutlets 3 or 4, narrowed and pointed at the ends, prominently ridged on the back, with a broad grooved ridge, red-brown, about 8 mm. long and 5 mm. wide.

A shrub 3-4 m. high, with numerous stout erect stems, and slender nearly straight branchlets marked by occasional large pale lenticels, pale yellow-green when they first appear, and dull reddish-brown during their first season, becoming very dark gray-brown the following year.

Monroe county: Borders of woods in low moist soil near Tannersville, *Britton and Porter*, July 4, 1896; *Canby and Sargent*, September, 1902; *W. M. Canby*, May, August and October, 1903.

17. *Cratægus dissona* Sargent.

Rhodora, V, 60 (1903); Bot. Gazette, XXXV, 379 (*Cratægus* in Northeastern Illinois).

Bucks county: Race-bank, Benjamin, near Sellersville, *C. D. Fretz* (No. 106), May and September, 1899; *Fretz* and *Sargent*, September, 1902. Also western New England to northeastern Illinois.

The anthers of the plants at Great Barrington, Berkshire county, Massachusetts, on which this species was established, are light purple, while those of the Sellersville plant are described by Dr. Fretz as light pink. I can detect no other difference. This shrub is evidently extremely rare in eastern Pennsylvania, while in western New England it is common and widely distributed.

18. *Cratægus alacris* n. sp.

Leaves rhombic or occasionally oblong-ovate, acuminate, mostly entire at the cuneate glandular base, sharply doubly serrate above, with straight glandular teeth, and deeply divided above the middle into numerous narrow acuminate lobes, dull vinous red as they unfold, nearly fully grown when the flowers open about the middle of May and then light yellow-green and glabrous with the exception of a few caducous hairs near the base of the upper side of the midribs, and at maturity thin but firm in texture, glabrous, dark blue-green on the upper and pale blue-green on the lower surface, 4–6 cm. long and 3.5–4.5 cm. wide, with thin yellow midribs, and slender primary veins arching very obliquely to the points of the lobes; petioles slender, slightly wing-margined at the apex, sparingly glandular early in the season, with minute deciduous glands, and 2–3 cm. in length; stipules linear, acuminate, glandular, fading pink, caducous, or foliaceous and lunate on the upper leaves of leading shoots. *Flowers* 1.8–2 cm. in diameter, on slender elongated glabrous pedicels, in usually 5-flowered glabrous corymbs, with oblong-ovate to linear glandular caducous bracts and bractlets; calyx-tube narrowly obconic, the lobes broad and short, gradually narrowed to the acuminate apex, entire, occasionally slightly serrate above the middle; stamens 8–10; anthers pale rose color; styles 3 or 4, surrounded at the base by a broad ring of long white hairs. *Fruit* ripening at the end of September, on slender pedicels, in drooping clusters, short-oblong or slightly obovate, bright red and covered with a glabrous bloom, 1–1.2 cm. long, 8–10 mm. broad; calyx prominent, with a wide but very shallow cavity, and spreading lobes, their tips mostly deciduous from the ripe fruit; flesh thin, dry and mealy; nutlets 3 or 4, rounded at the narrowed base, acute at the apex, prominently ridged on the back, with a broad deeply grooved ridge, 6–7 mm. long and 4–5 mm. wide.

A shrub 3–4 m. high, with slender nearly straight branchlets marked by occasional small pale lenticels, dark orange-green when they first appear, becoming purplish in their first season and dark red-brown the following year, and armed with numerous slender nearly straight purple ultimately gray-brown spines 3.5–5.5 cm. in length.

Bucks county: Alluvial bottom lands, Deep Run, near Sellersville, C. D. Fretz (No. 125, type!), May and September, 1900, May and September, 1903. Rare.

19. *Crataegus deducta* n. sp.

Leaves oval to ovate, acuminate, concave-cuneate at the entire base, coarsely doubly serrate above with glandular teeth and sharply divided into 3 or 4 pairs of short acute lateral lobes, more than half-grown when the flowers open about the 20th of May and then membranaceous, light yellow-green, smooth and shining above, pale below, and glabrous with the exception of a few caducous hairs on the upper side of the midribs, and at maturity thin but firm in texture, light bluish-green, 6–7 cm. long and 4–4.5 cm. wide, with stout yellow midribs and remote primary veins extending obliquely to the points of the lobes; petioles slender, slightly wing-margined at the apex, puberulous at first, soon glabrous, glandular with conspicuous stipitate dark caducous glands, and 2–2.5 cm. in length; leaves on vigorous shoots mostly ovate, full and rounded at the broad base, deeply lobed with acuminate lobes, and often 6 cm. long and wide. *Flowers* about 2 cm. in diameter, on slender glabrous pedicels, in compact 5–10-flowered corymbs, with conspicuously glandular oblong-obovate to lanceolate bracts and bractlets often persistent until after the flowers open; calyx-tube narrowly obconic, the lobes wide, coarsely glandular-serrate, reflexed after anthesis; stamens 7–9; styles 2–4, surrounded at the base by a few short pale hairs. *Fruit* ripening about the middle of October, on slender pedicels, in few-fruited clusters, short-oblong to ovate, angled and green when fully grown, becoming distinctly mamillate at the base and dull red when fully ripe, thickly covered with a glaucous bloom, 1–1.2 cm. long and broad; calyx prominent, without a tube, and with a wide shallow cavity, and spreading reflexed closely appressed lobes often deciduous from the ripe fruit; flesh thin, yellow, dry and mealy; nutlets 3 or 4, gradually narrowed and acute at the ends, prominently ridged on the broad back with a low wide ridge, 8–9 mm. long and 5 mm. wide.

A shrub 2–3 m. high, with erect stems and slender nearly straight branchlets marked by oblong pale lenticels, light orange-green when they first appear, becoming dull reddish-brown during their first winter and gray tinged with red the following season, and armed with numer-

ous very slender slightly curved lustrous purplish spines 4–6 cm. in length.

Bucks county: Near Sellersville, *C. D. Fretz* (No. 112, type!), May, 1898, May and October, 1899; *Fretz* and *Sargent*, September, 1899. Rare.

20. *Crataegus deltoides* Ashe.

Jour. Elisha Mitchell Sci. Soc., XVII, pt. 2, p. 19 (1901).

Leaves broadly ovate, acute and short-pointed at the apex, rounded truncate or occasionally abruptly cuneate at the wide base, sharply and often doubly serrate, with straight glandular teeth, and slightly divided into numerous small acuminate lobes; nearly fully grown when the flowers open about the end of May and then light yellow-green, roughened above by short pale hairs and sparingly villose along the base of the upper side of the midribs, and at maturity thin but firm in texture, dull blue-green and scabrate on the upper, and pale blue-green on the lower surface, 5–6 cm. long and 4–5 to nearly 6 cm. wide, with slender yellow midribs and 4 or 5 pairs of thin primary veins arching to the points of the larger lobes; petioles very slender, wing-margined at the apex, glandular, with minute sometimes persistent glands, 1.5–3 cm. in length; stipules linear, acuminate, glandular, fading red, caducous. *Flowers* 1.8–2 cm. in diameter, on elongated slender pedicels, in 5–8-flowered compact glabrous corymbs, with lanceolate conspicuously glandular bracts and bractlets mostly persistent until after the flowers fall; calyx-tube broadly obconic, the lobes gradually narrowed from wide bases, acuminate, entire, obscurely toothed, tipped with dark glands, reflexed after anthesis; stamens 10; anthers dark rose color; styles 3–5, surrounded at the base by a broad ring of matted pale hairs. *Fruit* ripening from the middle to the end of September, on long slender pedicels, in drooping few-fruited clusters, pyriform when first fully grown, becoming depressed-globose at maturity, slightly angled, without a bloom, bright red, 1.1–1.3 cm. in diameter and rather broader than long; calyx much enlarged, without a tube, and with a broad shallow cavity, and coarsely serrate erect and incurved lobes very conspicuous on the unripe fruit and persistent throughout the season; flesh thin, yellow, dry and mealy; nutlets thick, gradually narrowed and pointed at the ends, irregularly ridged and very deeply grooved on the back, about 7 mm. long and 5 mm. wide.

A shrub 2–3 m. high, with slender nearly straight branchlets marked by small pale lenticels, light orange-green when they first appear, orange-brown and lustrous during their first season, becoming dull

gray or gray-brown the following year, and armed with occasional stout purple lustrous spines 5-5.5 cm. in length.

Bucks county: Near Ridge Road, Rockhill, *C. D. Fretz* (No. 104, type), September, 1899, May and September, 1901; near Bruckers, Rockhill, *C. D. Fretz* (No. 103), May and September, 1899. Rare.

21. *Cratægus fretzii* n. sp.

Leaves ovate, acute, rounded or occasionally concave-cuneate or rarely truncate at the broad entire base, coarsely doubly serrate above, with straight or incurved glandular teeth, and more or less deeply divided into two or three pairs of broad acute lateral lobes, nearly fully grown when the flowers open about the 20th of May and then membranaceous, light yellow-green, roughened by short rigid white hairs and sparingly villose along the midribs on the upper surface, and pale or glaucous and glabrous on the lower surface, and at maturity subcoriaceous, dark blue-green and scabrate or nearly smooth above, pale bluish-green below, 6-8 cm. long and 4-6 cm. wide, with stout yellow midribs and four or five pairs of thin primary veins; petioles slender, grooved on the upper side, narrowly wing-margined toward the apex, sparingly glandular, villose while young, soon becoming glabrous, 1.5-2.5 cm. in length; stipules on leading shoots foliaceous, lunate, coarsely glandular-serrate, about 5 mm. long, caducous. *Flowers* about 1 cm. in diameter, on long slender glabrous pedicels, in lax 4- or 5-flowered corymbs; calyx-tube narrowly obconic, the lobes narrow, elongated, acuminate, tipped with dark red glands, entire or occasionally furnished above the middle with a few small glandular teeth, erect after anthesis; stamens usually eight; anthers small, dark rose color; styles 2-4. *Fruit* ripening about October 1, on stout erect pedicels, obovate, full and rounded at the apex, gradually narrowed from above the middle to the slender base, greenish-yellow with a crimson cheek destitute of bloom, 1.2-1.5 cm. long, 1-1.2 cm. broad; calyx little enlarged, without a tube, and with a wide shallow cavity, and erect spreading lobes most deciduous before the fruit ripens; flesh thin, yellow, dry and mealy; nutlets usually 4, thick, full and rounded at the ends, rounded and conspicuously ridged on the back, with a high deeply grooved ridge, 8-9 mm. long and 5 mm. wide.

A broad arborescent shrub 7-8 m. high, with stout intricately branched stems spreading into broad thickets.

Bucks county: Durham, in low rich soil, *C. D. Fretz* (No. 151, type), May and September, 1901; *Fretz* and *Sargent*, September, 1902.

This interesting thorn resembles in foliage and in the number of the stamens and the color of the anthers *Cratægus compta* Sarg., from

western New York, but differs from that species in its few-flowered corymbs, more slender and elongated mostly entire calyx-lobes, and in its more obovate greenish-yellow fruit without bloom, the fruit of *Crataegus compta* being bright cherry-red and coated with a thick glaucous bloom. It is named for its discoverer, Dr. Clayton Detweiler Fretz, the enthusiastic and industrious student of the flora of Bucks county.

22. *Crataegus scabriuscula* n. sp.

Leaves ovate to rhombic, acute or acuminate at the apex, full and rounded or concave-cuneate at the entire base, sharply doubly serrate above, with straight glandular teeth, and divided into 3 or 4 pairs of short broad acute lateral lobes, slightly tinged with red when they unfold, nearly half-grown when the flowers open about the 10th of May and then yellow-green and roughened above by short rigid white hairs and paler and glabrous below, and at maturity thin but firm in texture, light blue-green and scabrate on the upper and pale or glaucous on the lower surface, 4–5 cm. long and 3.5–4 cm. wide, with thin yellow mid-ribs and slender primary veins arching obliquely to the points of the lobes; petioles slender, grooved, slightly wing-margined at the apex, conspicuously glandular at first, the glands mostly deciduous, and 2–3 cm. in length; stipules linear, acuminate, glandular, fading pink caducous; leaves on vigorous shoots deltoid to broadly ovate, truncate or rounded at the base, more coarsely serrate and more deeply lobed, 5–6 cm. long and broad, with stout glandular petioles 1.2–1.6 cm. in length. *Flowers* about 1.5 cm. in diameter, on slender elongated pedicels, in compact 5–8-flowered corymbs, with linear glandular caducous bracts and bractlets; calyx-tube narrowly obconic, the lobes gradually narrowed from broad bases, acuminate, entire or slightly and irregularly serrate above the middle, their tips often bright red, reflexed after anthesis; stamens 6–8; anthers red; styles 3 or 4, surrounded at the base by a broad ring of hoary tomentum. *Fruit* ripening about the 1st of October on slender pedicels, in few-fruited drooping clusters, obovate, full and rounded at the apex, gradually narrowed from above the middle to the slender base, dull red, not pruinose, about 1 cm. long and 8 mm. wide; calyx enlarged and prominent, without a tube, and with a broad shallow cavity and spreading closely appressed mostly persistent sparingly serrate lobes red on the upper side below the middle; flesh thin, dry or mealy; nutlets 3 or 4.

An arborescent shrub 3–4 m. high, with slender nearly straight branchlets marked by numerous oblong pale lenticels, light yellow-green slightly tinged with red when they first appear, bright red-brown

and very lustrous during their first season and dull gray-brown the following year, and armed with numerous stout slightly curved bright chestnut-brown ultimately gray spines 4-6 cm. in length.

Bucks county: Durham, *C. D. Fretz* (No. 170, type), May and September, 1903; *Fretz and Sargent* (No. 160), September, 1902.

23. *Cratægus delicata* n. sp.

Leaves ovate, acute or acuminate, rounded, truncate or occasionally cuneate at the broad entire glandular base, sharply doubly serrate above, with straight slender teeth tipped with large dark glands, and deeply divided into 3 or 4 pairs of narrow acuminate lateral lobes, when they unfold deeply tinged with red, glabrous below and covered above with short lustrous white hairs, nearly fully grown when the flowers open the middle of May and then membranaceous, pale yellow-green, and hairy on the upper surface, and at maturity thin but firm in texture, blue-green and scabrate above, pale blue-green below, 3.5-4 cm. long and 2.5-4 cm. wide, with slender midribs and thin remote primary veins; petioles very slender, slightly wing-margined at the apex, at first sparingly pilose, soon glabrous, 1.2-1.5 cm. in length; leaves on vigorous shoots mostly truncate or occasionally subcordate at the base, more deeply lobed, and 5-6 cm. long and broad. *Flowers* about 1.5 cm. in diameter, on long hairy pedicels, in 4-7-flowered compact corymbs; calyx-tube narrowly obconic, glabrous, the lobes broad, acuminate, coarsely glandular-serrate toward the bright red apex, reflexed after anthesis; stamens 5 or 6; anthers dark rose color; styles 3, surrounded at the base by a ring of long snow-white hairs. *Fruit* ripening the middle of September, ovate to oblong, dull red, covered with a thick glaucous bloom, 1.4-1.5 cm. long, 1-1.2 cm. wide; calyx little enlarged, without a tube, and with a wide shallow cavity, and spreading appressed lobes dark red on the upper side below the middle, their tips mostly deciduous from the ripe fruit; flesh thick and pulpy; nutlets 3, gradually narrowed to the obtuse rounded ends, very prominently ridged on the broad rounded back, with a high broad deeply grooved ridge, about 8 mm. long and 5 mm. wide.

A shrub with numerous erect stems 2-3 m. high and 5-8 cm. in diameter, covered with silvery-gray slightly fissured scaly bark, and slender slightly zigzag branchlets dark orange-green when they first appear, dark red-brown and very lustrous during their first winter, becoming ashy-gray or gray tinged with brown in their second or third year, and armed with numerous stout slightly curved red-brown shining spines 3-3½ cm. in length.

Bucks county: Hillsides near Sellersville, *C. D. Fretz* (No. 177, type), May and September, 1903.

IV.—TENUIFOLIÆ.

1.—Fruit longer than wide.

Fruit oblong; anthers dark pink or purple.

Petioles 1.5–2 cm. long.

Leaf-lobes short, mostly pointing forward, 1. *C. tenella*.

Leaf-lobes long, spreading, often recurved, 2. *C. rufipes*.

Petioles 2–3 cm. long.

Pedicels elongated, slender; corymbs broad and open; leaves broad-ovate to nearly orbicular, yellow-green,

3. *C. lata*.

Pedicels short; corymbs compact; leaves ovate to ovate-oblong, blue-green.

Corymbs 4–6-flowered; mature leaves scabrate,

4. *C. collinsiana*.

Corymbs 8–12-flowered; mature leaves smooth,

5. *C. pumila*.

Fruit obovate, ovate-oblong to subglobose.

Leaves 5–9-lobed.

Petioles slender, 2.5–3 cm. long; pedicels slender, elongated.

Corymbs open, 7–12-flowered.

Stamens 10; anthers rose color; mature leaves scabrate,

6. *C. firma*.

Stamens 5–8; anthers rose-pink; fruit glaucous; mature leaves glabrous, 7. *C. gruberi*.

Corymbs compact, 5–12-flowered; stamens 5–10; fruit scarlet.

Anthers dark rose color or purple; pedicels elongated; leaves yellow-green, 8. *C. ampla*.

Anthers light purple; pedicels short; leaves blue-green, 9. *C. populnea*.

Petioles stout, 2–3 cm. long; pedicels stout; corymbs compact, 8–12-flowered.

Stamens 6–8; anthers purple; fruit yellowish-red; leaves thin, 10. *C. condensa*.

Stamens 10; anthers rose color; fruit cherry-red; leaves thick, 11. *C. moyeriana*.

Leaves 9–11-lobed.

Petioles 2–3 cm. long; anthers light pink or rose color; ripe fruit with a glaucous bloom.

Stamens 5–7; fruit dark red, 12. *C. saturata*.

Stamens 8–10; fruit scarlet, 13. *C. miniata*.

Petioles 3–4 cm. long; anthers dark pink.

Corymbs narrow, compact; fruit 9–12 mm. long; petioles very slender, 14. *C. longipetiolata*.

Corymbs broad; fruit bright cherry-red, 1.3–1.5 cm. long; petioles stout, 15. *C. insolita*.

2.—Fruit globose to depressed-globose; anthers dark pink or purple.

Fruit scarlet or bright crimson; leaves 9–11-lobed; corymbs 5–10-flowered, compact.

Leaves ovate-oblong, 4.5–6 cm. in length; fruit 1.2–1.5 cm. in diameter, 16. *C. stolonifera*.

Leaves ovate, 3.5–4 cm. in length; fruit 8–10 mm. in diameter, 17. *C. modica*.

Fruit with a glaucous bloom, 1.2–1.5 cm. in diameter.

Leaves 7–9-lobed; petioles and pedicels stout; corymbs broad and open, 7–12-flowered, 18. *C. vittata*.

Leaf-lobes numerous; petioles and pedicels slender; corymbs compact, 5–9-flowered, 19. *C. sequax*.

1. *Cratægus tenella* Ashe.

Ann. Carnegie Mus., I, pt. 3, 388 (1902).—Sargent, Bot. Gazette, XXXV, 108 (The Genus *Cratægus* in New Castle County, Delaware).

Leaves ovate, acuminate, abruptly cuneate or rounded at the broad entire base, sharply doubly serrate above, with slender glandular teeth, and divided into 4 or 5 pairs of short acuminate lateral lobes mostly pointing forward, deeply tinged with red when they unfold and coated above with long pale hairs, nearly half-grown when the flowers open the middle of May and then light yellow-green, glabrous below and covered above by short white hairs, and at maturity membranaceous, glabrous, dark yellow-green on the upper and pale and glaucous on the lower surface, 4–6 cm. long and 3–4.5 cm. wide, with very slender midribs and primary veins; petioles slender, slightly grooved on the upper side, sparingly glandular, with minute scattered caducous glands, 1.5–2 cm. long; stipules linear, acuminate, glandular, mostly deciduous before the flowers open. *Flowers* 1.2–1.4 cm. in diameter, on slender glabrous pedicels, in broad many-flowered corymbs, with oblong-obovate to linear scarious caducous bracts and bractlets; calyx-tube narrowly obconic, the lobes narrow, long-pointed and acuminate, usually irregularly serrate above the middle, reflexed after anthesis; stamens 5–10; anthers small, dark rose color; styles 2 or 3, surrounded at the base by a narrow ring of hoary tomentum. *Fruit* ripening early in September on long slender pedicels, in few-fruited drooping clusters, and often persistent on the branches until October, short-oblong or rarely obovate, bright scarlet, lustrous, 1–1.2 cm. long and 6–7 mm. wide, calyx little enlarged, with a narrow shallow cavity, and spreading closely appressed lobes often deciduous from the ripe fruit; flesh yellow, soft and pulpy; nutlets 2 or 3, rounded at the base, gradually narrowed and acute at the apex, prominently ridged on the back, with a broad high deeply grooved ridge, about 7 mm. long and 4 mm. wide.

A shrub 3–4 m. high, with numerous erect stems covered with pale gray bark, and slender nearly straight branchlets marked by small pale lenticles, orange-green when they first appear, and rather dull reddish-

brown during their first winter, becoming ashy-gray in their second or third years, and armed with stout straight or slightly curved bright chestnut-brown shining spines 2-3½ cm. in length.

Delaware county: Common; *B. H. Smith* (No. 199, type, *teste* Smith, Nos. 200, 206, 207). Bucks county: Hills near Sellersville, *C. D. Fretz* (No. 13), August, 1899, May, 1901, (No. 100) September, 1899, (No. 101) May and September, 1901, (No. 130) May and September, 1900, (No. 142) May and September, 1901, (No. 143) May and September, 1901; *Fretz and Sargent* (No. 105), September, 1899. Berks county: Banks of Sacony creek, near Kutztown, *C. L. Gruber* (No. 17), 1901, May and August, 1903. Monroe county: Between Tannersville and Stroudsburg, *W. M. Canby*, May and August, 1903, without flowers, and doubtfully referred to this species.

2. *Cratægus rufipes* Ashe.

Jour. Elisha Mitchell Sci. Soc., Vol. XX, p. 51, 1904.

Leaves oblong-ovate, long-pointed and acuminate at the apex, rounded, cuneate or truncate at the broad base, finely doubly serrate, with slender straight acuminate teeth, and deeply divided into 4-6 pairs of lateral spreading and often recurved acuminate lobes, nearly fully grown when the flowers open from the 15th to the 20th of May and then roughened above by short pale hairs and glabrous below, and at maturity membranaceous, yellow-green, lustrous and slightly scabrate on the upper and pale on the lower surface, 4.5-6.5 cm. long and 4-5 cm. wide, with thin midribs and slender veins arching obliquely to the points of the lobes; petioles slender, sparingly glandular, with minute scattered glands, 1.5-2 cm. in length; leaves on vigorous shoots mostly cuneate at the base, very coarsely serrate, more deeply lobed, occasionally 8-9 cm. long and 6-7 cm. wide, with broadly winged petioles and large foliaceous lunate stipules. *Flowers* 1.3-1.5 cm. in diameter, on elongated slender glabrous pedicels, in wide many-flowered corymbs, with linear glandular bracts and bractlets mostly deciduous before the flowers open; calyx narrowly obconic, the lobes gradually narrowed from broad bases into long slender acuminate tips, irregularly glandular-serrate, reflexed after anthesis; stamens 5-8; anthers dark rose color; styles 2 or 3, surrounded at the base by a narrow ring of pale tomentum. *Fruit* ripening the middle of September on long slender drooping pedicels, in wide many-fruited clusters, narrow-pyriform until nearly ripe, becoming oblong to oval, gradually narrowed and rounded at the base, bright scarlet mottled with green or russet, 1-1.2 cm. long and 6-8 mm. wide; calyx much enlarged, with a broad shallow cavity, and elongated reflexed closely appressed usually persistent lobes;

flesh soft, orange or yellow-orange sometimes slightly tinged with red; nutlets 2 or 3.

A shrub 2-4 m. high, with numerous flexuous ascending branches forming a narrow oblong head, and slender nearly straight branchlets marked by many small pale lenticels, dull dark red-brown during their first season, becoming pale gray-brown the following year, and armed with slender slightly curved bright chestnut-brown shining ultimately gray-brown spines 2-3 cm. long, becoming elongated and forked on the large branches.

Berks county: Near Kutztown, *C. L. Gruber* (No. 128, type!), 1902, May and August, 1903, September 1904; North Heidelberg, *C. L. Gruber* (No. 173), 1903, May and August, 1904. Bucks county: Near Sellersville, *C. D. Fretz* (No. 174), May and September, 1903.

The anthers of the Bucks county plant are described by Dr. Fretz as light pink. The leaves are rather less deeply lobed and the fruit is persistent until after all the leaves have fallen.

3. *Cratægus lata* n. sp.

Leaves broadly ovate to nearly orbicular, short-pointed and acuminate at the apex, rounded, truncate, slightly cordate or rarely cuneate at the wide entire often glandular base, sharply doubly serrate above, with slender glandular teeth, and divided above the middle into numerous short acuminate lobes; when they unfold tinged with red, slightly hairy above and glabrous below, nearly fully grown when the flowers open about the 20th of May and then very thin, nearly glabrous, and scabrate above, and at maturity membranaceous, light yellow-green and slightly roughened on the upper and pale on the lower surface, 4.5-6 cm. long and wide, and often, especially on leading shoots, rather wider than long, with slender yellow midribs, and 6 or 7 pairs of thin primary veins extending obliquely to the points of the lobes; petioles very slender, glandular, with minute often persistent glands, 2-3 cm. in length. *Flowers* about 1.5 cm. in diameter, on slender elongated glabrous pedicels, in wide open 7-15-flowered corymbs; calyx-tube narrowly obconic, the lobes narrow, gradually contracted into long slender tips, entire or occasionally irregularly glandular-toothed, reflexed after anthesis; stamens 5-8; anthers dark purple; styles 2-4, usually 3, surrounded at the base by a narrow ring of pale tomentum. *Fruit* ripening at the end of September, on slender drooping pedicels, in few-fruited clusters, oblong, gradually narrowed and rounded at the ends, bright scarlet, lustrous, 1-1.2 cm. long and about 7 mm. wide; calyx little enlarged, with a narrow shallow cavity and spreading lobes, often entirely deciduous from the ripe fruit; flesh yellow, rather juicy; nut-

lets 2-3, rounded at the base, gradually narrowed and acute at the apex, ridged on the back, with a low grooved ridge, 6-7 mm. long and 3-4 mm. wide.

An arborescent shrub 3-4 m. high, with stout ascending stems, and slender nearly straight branchlets marked by occasional small pale lenticels, light orange to reddish-brown and lustrous during their first winter and ashy-gray the following year, and armed with slender slightly curved bright chestnut-brown shining spines 2.5-3 cm. in length.

Bucks county: Hillside near Sellersville, *C. D. Fretz* (No. 140, type), May and September, 1901, September, 1903.

4. *Cratægus collinsiana* n. sp.

Leaves oblong-ovate, acuminate, gradually narrowed and cuneate or full and rounded at the entire base, finely often doubly serrate, with broad straight glandular teeth, and slightly lobed, with numerous short lobes, more than half-grown when the flowers open the middle of May and then membranaceous, light yellow-green and roughened above by short white hairs and pale below, and at maturity thick and firm in texture, dark blue-green and scabrate on the upper, and light bluish-green on the lower surface, 5-6 cm. long and 4-5 cm. wide, with slender mid-ribs, and 5 or 6 pairs of thin primary veins extending very obliquely to the points of the lobes; petioles slender, slightly wing-margined at the apex, usually without glands, 2-3 cm. long. *Flowers* 1-1.2 cm. in diameter, on slender pedicels, in very compact 4-6-flowered corymbs, with linear glandular caducous bracts and bractlets; calyx-tube narrowly obconic, the lobes gradually narrowed and acuminate, glandular-serrate especially above the middle, tipped with dark red glands, reflexed after anthesis; stamens 3-7; anthers red; styles 2 or 3. *Fruit* ripening and falling before the middle of September on short pedicels, in few-fruited clusters, short-oblong, full and rounded at the ends, dark crimson, lustrous, about 1 cm. long and 8 mm. wide; calyx little enlarged, with a deep narrow cavity, and spreading lobes, their tips deciduous from the ripe fruit; flesh thick, yellow, soft and pulpy; nutlets 2 or 3, gradually narrowed and acute at the ends, prominently ridged on the back, with a broad deeply grooved ridge, 6-7 mm. long and 4 mm. wide.

A tree 3-4 m. high, with a short erect trunk 7-8 cm. in diameter, and slender zigzag branchlets marked by numerous small pale lenticels, dark orange color when they first appear, dark dull red-brown during their first year, becoming dark gray-brown the following season, and armed with very stout straight or slightly curved bright red ultimately dark gray-brown spines 2.5-4 cm. in length.

Bucks county: Meadow at Hilltop, near Sellersville, *Fretz* and *Sargent* (No. 163, type!), September, 1902; *C. D. Fretz*, May and September, 1903.

This species is named in memory of *Zacchaeus Collins* (1764–1831), the distinguished Philadelphia botanist, who was one of the early collectors of plants in Bucks county.

5. *Crataegus pumila* n. sp.

Leaves ovate, acuminate, rounded or cuneate at the usually unsymmetrical base, finely serrate, with slender glandular teeth, and deeply divided into numerous narrow spreading lateral lobes, about half-grown when the flowers open the 20th of May and then light yellow-green and covered above with short white hairs and pale and glabrous below, and at maturity membranaceous, glabrous, bluish-green on the upper and glaucous on the lower surface, 4.5–6 cm. long and 3.5–5 cm. wide, with slender midribs, and thin primary veins arching obliquely to the points of the lobes; pedicels slender, grooved on the upper side, sparingly glandular, with mostly deciduous glands, 2.5–3 cm. in length. *Flowers* 1.2–1.4 cm. in diameter, on short glabrous pedicels, in very compact 8–12-flowered compound corymbs, with linear glandular caducous bracts and bractlets; calyx-tube narrowly obconic, the lobes slender, acuminate, tipped with dark red glands, entire or occasionally with one or two teeth near the middle, reflexed after anthesis; stamens 6–10; anthers deep red; styles 3–5, surrounded at the base by a narrow ring of hoary tomentum. *Fruit* ripening toward the end of September, in few-fruited clusters, oblong, rounded at the ends, dark red and lustrous, 1.2–1.8 cm. in length, 8–10 mm. in diameter; calyx little enlarged, with a broad shallow cavity, and spreading lobes mostly deciduous from the ripe fruit; flesh thick, yellow, very soft and pulpy; nutlets 3–5, narrowed at the ends, rounded at the base, acute at the apex, slightly ridged on the back, 1.6–1.7 cm. long and 4–5 mm. wide.

A shrub 1–2 m. high, with numerous erect stems, and slender slightly zigzag branchlets marked by small oblong pale lenticels, bright chestnut-brown and lustrous when they first appear, becoming dull reddish-brown the following year, and armed with numerous stout straight bright red-brown shining spines about 3 cm. in length.

Bucks county: Hillsides, in thickets near Sellersville, *C. D. Fretz* (No. 139, type!), May, 1901, May and September, 1903.

6. *Crataegus firma* n. sp.

Leaves oblong-ovate, acuminate, rounded or cuneate at the gradually narrowed entire base, coarsely doubly serrate above, with straight glandular teeth, and usually slightly divided above the middle into 2 or

3 pairs of short acute lobes, when they unfold deeply tinged with red, glabrous below and covered above with short shining white hairs, about half-grown when the flowers open from the 15th to the 20th of May and then membranaceous, pale bluish-green and nearly glabrous above with the exception of a few scattered hairs and a slight pubescence on the upper side of the midribs, and pale below, and at maturity thick and firm in texture, bluish-green, smooth and glabrous on the upper, light yellow-green on the lower surface, 5.5–6 cm. long and 4–4.5 cm. wide, with thick midribs, and usually 5 pairs of slender primary veins; petioles slender, grooved on the upper side, slightly wing-margined at the apex, sparingly glandular, with minute dark red glands, at first slightly pubescent, soon glabrous, 2.5–3 cm. in length; stipules linear to lanceolate, glandular, fading rose color, caducous. *Flowers* 2 cm. in diameter, on long slender glabrous pedicels, in usually 7–10-flowered corymbs, with linear glandular caducous bracts and bractlets; calyx-tube narrowly obconic, the lobes slender, acuminate, entire or occasionally irregularly toothed above the middle, tipped with minute dark glands, reflexed after anthesis; stamens 10; anthers rose color; styles 2–4, surrounded at the base by a narrow ring of pale tomentum. *Fruit* ripening from the middle to the end of September on drooping pedicels, in few-fruited clusters, short-oblong to obovate, crimson, lustrous, 1.2–1.4 cm. long, 1–1.2 cm. wide; calyx only slightly enlarged, with a wide shallow cavity, and spreading or erect lobes, their tips usually deciduous from the ripe fruit, flesh thick, yellow, rather juicy; nutlets usually 3 or 4, full and rounded at the base, gradually narrowed to the acute or rounded apex, ridged on the back, with a broad high ridge 7–8 mm. long and 4–5 mm. wide.

A tree sometimes 7 m. high, with a short stem 3.5–3.8 cm. in diameter, dividing near the ground into several stout erect stems, covered with gray-brown scaly bark, and forming a narrow irregular head, and stout nearly straight branchlets marked by few oblong pale lenticels, dark orange color when they first appear, pale orange color to light reddish-brown and very lustrous during their first winter, pale gray-brown the following year, and armed with numerous very stout curved chestnut-brown shining spines 2–3 cm. in length.

Bucks county: Banks of a stream in the meadow near Pleasant Spring bridge, Hilltop near Sellersville, *C. D. Fretz* (No. 128, type!), May and September, 1900; *Fretz and Sargent*, September, 1902.

7. *Cratægus gruberi* Ashe.

Ann. Carnegie Mus., I, 3 (1902).—Gruber, Proc. Berks County Nat. Sci. Club, I, 11 (*Cratægus* in Berks County, II).

Leaves ovate to oval or rhombic, acuminate and often long-pointed

at the apex, concave-cuneate or rounded at the entire base, sharply doubly serrate above, with straight glandular teeth, and slightly divided into 3 or 4 pairs of short acute or acuminate spreading lobes; when they unfold reddish-bronze color, pubescent above and glabrous below with the exception of small axillary tufts of pale pubescence sometimes persistent during the season, about half-grown when the flowers open during the second week in May and then slightly roughened above by short white hairs, and at maturity membranaceous, dark green, scabrate and lustrous on the upper and pale or glaucous on the lower surface; 3–5 cm. long and 2.5–4 cm. wide, with slender midribs, and thin primary veins extending obliquely to the points of the lobes, turning yellow or orange-yellow occasionally tinged with red before falling; petioles slender, nearly terete, slightly wing-margined at the apex, at first puberulous, soon glabrous, sparingly glandular, with minute often persistent glands, 1.5–3 cm. in length; stipules ligulate to falcate, glandular, fading rose color, caducous; leaves on vigorous leading shoots ovate, truncate to cordate at the broad base, more deeply lobed and often deeply cleft below the middle, sometimes 8–9 cm. long and 6–7.5 cm. wide, with stout winged conspicuously glandular petioles. *Flowers* 1.6–2 cm. in diameter on long slender glabrous pedicels, in 3–15, usually 8–10-flowered corymbs, with obovate to linear glandular bracts and bractlets, mostly persistent until after the flowers open; calyx-tube broadly obconic, the lobes slender, acuminate, entire, without glands, glabrous or minutely pubescent toward the reddish apex, reflexed after anthesis; stamens 5–8, usually 5; anthers pink or rose-pink; styles 2–4, usually 3, surrounded at the base by a broad ring of hoary tomentum. *Fruit* ripening late in September and falling with the leaves, on slender pedicels, in few-fruited drooping clusters, obovate to obovate-oblong or rarely subglobose, concave at the base, slightly concave or rounded at the apex, red or reddish-scarlet, marked by russet or greenish-orange blotches, dull or lustrous, covered with a glaucous bloom, rarely puberulous at the ends, 1.2–1.6 cm. long, 1.1–1.5 cm. wide; calyx somewhat enlarged, with a short tube, a wide shallow cavity, and spreading often erect and incurved lobes red on the upper side below the middle; flesh orange or orange-yellow frequently tinged with red, soft, juicy and acid; nutlets 2–4, acute at the ends, ridged on the back, with a deeply grooved ridge, 7–8.5 mm. in length.

A shrub or slender tree occasionally 3–4 m. high, with a short more or less flattened or angled trunk rarely 1.8 cm. in diameter, and covered with rough gray scaly bark, numerous ascending or semi-erect slender flexuose branches, and slender slightly zigzag branchlets marked by

minute pale lenticels, light reddish-brown when they first appear, light red-brown and lustrous during their first year and grayish-brown the following season, and armed with numerous slender straight or slightly curved red-brown shining spines 3-5 cm. long, becoming branched on old stems and branches and sometimes 7 cm. long.

Berks county: Fields, fence-rows and borders of woods in rich gravelly soil, Kutztown and near West Lockport, *C. L. Gruber* (Nos. 6 and 190), May, 1901, May and September, 1904.

Mr. Gruber calls attention to the fact that on this species "a number of small leaves are found distinct in shape from the larger ones. These are 2-3.5 cm. long and wide; broadly ovate, rhombic, fan-shaped, or nearly ovate, sometimes ovate, rarely suborbicular; base widely obtuse to broadly cuneate; apex obtuse, abruptly acute, or rarely almost rounded; lower portion serrate often till near the petiole, the portion above the basal sides doubly serrate, cut-serrate, or slightly lobed."

Cratægus perlevis (Ashe, *Jour. Elisha Mitchell Sci. Soc.*, Vol. XX, p. 48, 1904), known only from a single plant near Sacony creek in the neighborhood of Kutztown (*C. L. Gruber*, No. 15), is probably only a form of *Cratægus gruberi*, with leaves which are nearly glabrous below while young and smooth and glabrous above at maturity, and with slightly brighter-colored fruit remaining later on the branches in the autumn.

8. *Cratægus ampla* n. sp.

Leaves ovate to oval, abruptly narrowed, acuminate and usually long-pointed at the apex, full and rounded or rarely cuneate at the broad mostly entire base, coarsely doubly serrate above, with straight glandular teeth, and divided into 4 or 5 pairs of short spreading acuminate lobes, more than half-grown when the flowers open from the 7th to the 10th of May and then slightly tinged with red and roughened above by short white caducous hairs and pale and glabrous below, and at maturity membranaceous, smooth, glabrous or puberulous, dark yellow-green on the upper and pale or glaucous on the lower surface, 6 to 8 cm. long and 5 to 7 cm. wide, with slender yellow midribs and primary veins, turning yellow sometimes tinged with red in the autumn and falling late in September; petioles slender, grooved on the upper side, slightly wing-margined toward the apex, sparingly glandular above the middle, with stipitate deciduous glands, 2.5-4 cm. in length. *Flowers* 1.3-1.8 cm. in diameter, on slender glabrous pedicels, in compact usually 5-12-flowered corymbs; calyx-tube narrowly obconic, the lobes gradually narrowed, slender, acuminate, entire or rarely sparingly serrate near the base, red toward the apex, reflexed after anthesis; stamens 5-10;

anthers rich purple; styles 2-4, usually 3, surrounded at the base by a narrow ring of hoary tomentum. *Fruit* ripening the end of August and falling as soon as ripe, on elongated slender pedicels, in wide drooping clusters, short-oblong or rarely depressed-globose, scarlet often blotched with russet, concave at the base, lustrous, marked by small pale dots, 1.2-1.4 cm. long, 1.1-1.2 cm. thick; calyx little enlarged with a wide shallow cavity, and spreading closely appressed lobes mostly persistent on the ripe fruit; flesh orange-yellow, soft; nutlets 3, gradually narrowed and rounded at the ends, only slightly ridged on the back, with a broad low ridge, about 7 mm. long and 4 mm. wide.

A shrubby tree 3-4 m. high, with a trunk 20-30 cm. in diameter, covered with ashy-gray scaly bark, and dividing near the ground into numerous ascending gray branches forming a narrow oval head, and slender nearly straight branchlets marked by small pale lenticels, light red-brown during their first season and light gray-brown to ashy-gray the following year, and sparingly armed with slender straight or recurved chestnut-brown spines, becoming ultimately dark gray and 3-7 cm. in length.

Berks county: Dry gravelly banks near Sacony creek, Kutztown, C. L. Gruber (No. 32, type), 1901, May, 1902, August, 1904.

9. *Cratægus populnea* Ashe.

Ann. Carnegie Mus., I, pt. 3, 395 (1902); Gruber, Proc. Berks County Nat. Sci. Club, I, 11 (*Cratægus* in Berks County).

Leaves ovate, acuminate, rounded, truncate or occasionally cuneate at the wide glandular base, sharply doubly serrate above, with straight glandular teeth and slightly divided into 2 or 3 pairs of broad acute lateral lobes, about one-third grown when the flowers open the middle of May and then membranaceous, yellow-green and slightly roughened above by short white hairs, pale and glabrous below, and at maturity thin but firm in texture, glabrous, dark bluish-green and lustrous on the upper and pale on the lower surface, 6-6.5 cm. long, 5.5-6 cm. wide, with slender midribs and usually 4 pairs of thin primary veins extending obliquely to the points of the lobes; petioles slender, slightly wing-margined at the apex, glabrous, glandular, with persistent glands, 2.5-3.5 cm. in length. *Flowers* 1.4-1.8 or occasionally 2 cm. in diameter, on stout pedicels, in compact usually 5-10-flowered corymbs; calyx-tube narrowly obconic, the lobes very slender, long-acuminate, usually entire or furnished above the middle with an occasional tooth, reflexed after anthesis; stamens 5-10; anthers light purple; styles 2-4, surrounded at the base by a ring of pale tomentum. *Fruit* ripening toward the end of September and mostly persistent until after the fall

of the leaves, on slender pedicels, in spreading few-fruited clusters, globose to oblong-globose, often slightly tapering at the base, scarlet, sparingly blotched with orange or russet, 1.3–1.7 cm. long; calyx enlarged with a broad shallow cavity and spreading and incurved lobes; flesh thick, juicy, soft, yellow or orange, sweetish acid; nutlets usually 3 or 4, full and rounded at the base, gradually narrowed to the rounded apex, prominently ridged on the back, with a broad deeply grooved ridge, 7–8 cm. long and 3–4 cm. wide.

A tree sometimes 4 m. high, with a short trunk 25–30 cm. in diameter covered with rough ashy-gray to dark gray bark, spreading and ascending stout flexuose gray branches forming a broad round-topped head, and slender slightly zigzag branchlets marked by numerous pale lenticels, dark green tinged with red when they first appear, bright chestnut-brown and very lustrous during their first winter, becoming dull gray-brown the following year, and armed with numerous stout conical spines brown or purplish-brown during their first season, dark gray the following year and 1–3 cm. in length, becoming on old trunks elongated and much-branched.

Berks county: Banks of Sacony creek, near Kutztown, *C. L. Gruber* (No. 31, type!), 1901, May, 1902, and September, 1903.

10. *Crataegus condens* n. sp.

Leaves oblong-ovate, acuminate, full and rounded at the entire base, coarsely serrate above, with broad glandular teeth, and slightly divided into 3 or 4 pairs of short acute spreading lobes, nearly half-grown when the flowers open about the 20th of May and then very thin, light yellow-green and slightly roughened above by short white hairs and pale and glabrous below, and at maturity thin but firm in texture, dark yellow-green, smooth and glabrous on the upper and light yellow-green on the lower surface, 5–7 cm. long and 4.5–5.5 cm. wide, with stout yellow midribs, and slender primary veins arching obliquely to the points of the lobes; petioles stout, usually without glands, 2–3 cm. in length. *Flowers* about 1.2 cm. in diameter, on short stout glabrous pedicels, in crowded compact usually 8–12-flowered corymbs, with linear glandular bracts and bractlets mostly deciduous before the flowers open; calyx-tube narrowly obconic, the lobes gradually narrowed from broad bases, slender, acuminate, entire or occasionally sparingly toothed, reflexed after anthesis; stamens 6–8; anthers purple; styles 2 or 3; surrounded at the base by a narrow ring of hoary tomentum. *Fruit* ripening the middle of September, on short stout pedicels, in few-fruited drooping clusters, obovate, yellowish-red and lustrous, about 1 cm. long and 8–10 mm. wide; calyx little enlarged, with a narrow shallow cavity, and

spreading lobes, their tips mostly deciduous from the ripe fruit; flesh yellow, thick and pulpy; nutlets 2 or 3, gradually narrowed and rounded at the base, acute at the apex, ridged on the back, with a high often grooved ridge, 5-6 mm. long and 3-4 mm. wide.

A shrub about 1 m. high, with stout contorted stems and branches, covered with light brown furrowed bark, and slender branchlets marked by many small pale lenticels, dark orange-green when they first appear, bright red-brown and lustrous during their first season, becoming dark brown the following year, and armed with very stout chestnut-colored spines 3-3.5 cm. in length.

Bucks county: Meadows at Pleasant Spring bridge, Hilltop near Sellersville, *C. D. Fretz* (No. 173, type!), May, July and September, 1903.

11. *Cratægus moyeriana* n. sp.

Leaves ovate to oblong-ovate, acute or acuminate, rounded or cuneate at the broad entire base, coarsely doubly serrate above, with straight gland-tipped teeth, and slightly divided into 2 or 3 pairs of short broad acute lateral lobes, deeply tinged with red and covered above with short white hairs and pale and glabrous below when they unfold, nearly fully grown when the flowers open about the 20th of May and then membranaceous, yellow-green and still slightly hairy above especially along the midribs, and at maturity thick to subcoriaceous, dark yellow-green and scabrate on the upper, pale on the lower surface, 7.5-8 cm. long and 6-6.5 cm. wide, with stout yellow midribs and 4 or 5 pairs of thin remote primary veins; petioles stout, grooved on the upper side, slightly wing-margined at the apex, 2.5-3 cm. long; stipules foliaceous, lunate, glandular-serrate, soon deciduous; leaves on vigorous shoots rounded or cordate at the wide base, more coarsely serrate, often deeply divided into broad acute or acuminate lateral lobes and often 6-7 cm. long and wide, with stout glandular winged petioles 1.5-2 cm. long. *Flowers* about 1.8 cm. in diameter, on short stout glabrous pedicels, in very compact 6-9-flowered corymbs, with usually oblong-obovate glandular bracts and bractlets mostly deciduous before the flowers open; calyx narrowly obconic, the lobes slender, acuminate, entire or occasionally toothed toward the apex, tipped with dark glands, reflexed after anthesis; stamens 10; anthers rose color; styles 2-4, surrounded at the base by a narrow ring of hoary tomentum. *Fruit* ripening the middle of September on short pedicels, in 2 or 3-fruited clusters, obovate to short-oblong, cherry-red, marked by occasional large dark dots, 1.3-1.5 cm. long and 1-1.1 cm. wide; calyx little enlarged, with a narrow cavity, and erect and incurved lobes often

deciduous from the ripe fruit; flesh thin and yellow; nutlets usually 3, full and rounded at the base, rounded at the narrow apex, ridged on the back, with a high narrow ridge, about 7 mm. long and 4 mm. wide.

A tree-like shrub sometimes 3 m. high, with stout erect stems covered with ashy-gray bark, and stout slightly zigzag branchlets marked by small pale lenticels, dark red-brown when they first appear, light red-brown and very lustrous during their first season, becoming dark gray-brown the following year, and occasionally armed with short stout nearly straight bright red-brown shining spines.

Bucks county: Near Sellersville, *C. D. Fretz* (No. 111, type!), May, 1899, May and September, 1901; *Fretz* and *Sargent*, September, 1902. Rare.

This species is named for Isaac Shoemaker Moyer, A.M., M.D. (1838-1898), long a practicing physician at Quakertown in Bucks county, deeply interested in botany, ornithology and entomology, and the author of a flora of Bucks county published in 1876 in General W. W. H. Davis' *History of Bucks County*.

12. *Cratægus saturata* n. sp.

Leaves oblong-ovate, acuminate, cuneate or rounded at the base, finely doubly serrate, with straight glandular teeth, and divided into 4 or 5 pairs of short acuminate lateral lobes, slightly tinged with red when they unfold, nearly half-grown when the flowers open about the 20th of May and then membranaceous, glabrous with the exception of a few short scattered hairs toward the base on the upper side of the midribs and glabrous below, and at maturity thin but rather rigid in texture, glabrous, very smooth and dark blue-green on the upper and pale on the lower surface, 4-6 cm. long and 3-3.5 cm. wide, with thin midribs, and very slender primary veins extending obliquely to the points of the lobes; petioles slender, slightly wing-margined at the apex, sparingly glandular, with often persistent glands, 2-2.5 cm. in length; stipules linear, lanceolate to linear-lanceolate, glandular, with minute long-stalked glands, fading rose color, mostly deciduous before the flowers open; leaves on vigorous shoots thicker, much more deeply lobed, with broad acute lobes, and often 6 cm. long and nearly as wide. *Flowers* about 1.4 cm. in diameter, on short slender glabrous pedicels, in usually 4-6 very compact corymbs, with linear acute glandular bracts and bractlets; calyx-tube broadly obconic, the lobes wide, acuminate, usually entire, glandular, with stipitate glands, and reflexed after anthesis; stamens 5-7; anthers rose color; styles 3 or 4, surmounted at the base by a narrow ring of pale tomentum. *Fruit* ripening

at the end of September, on stout erect pedicels, in few-fruited clusters, short-oblong to subglobose, dark red, covered with a glaucous bloom, about 1 cm. in diameter; calyx enlarged, with a narrow deep cavity, and erect more or less incurved or spreading lobes often deciduous from the ripe fruit; flesh yellow, dry and mealy; nutlets 3 or 4, gradually narrowed and acute or rounded at the ends, ridged on the back with a low deeply grooved ridge, 6–7 mm. long and about 4 mm. wide.

An arborescent shrub spreading into broad clumps, 4–5 m. high, with numerous stout erect stems forming a broad head, and slender nearly straight branchlets marked by many small oblong pale lenticels, bright reddish-brown or green tinged with red when they first appear, bright reddish-brown and very lustrous during their first winter, becoming dull gray-brown the following year, and armed with slender straight or slightly curved purplish shining spines 3–6 cm. in length.

Bucks county: Near a stream in the meadow at Pleasant Spring bridge, Hilltop near Sellersville, *Fretz* and *Sargent* (No. 110, type!), September, 1899; *C. D. Fretz*, May, 1900.

13. *Crataegus miniata* Ashe.

Jour. Elisha Mitchell Sci. Soc., Vol. XX, p. 51, 1904.

Leaves oblong-ovate, long-pointed and acuminate at the apex, concave-cuneate or rounded at the entire or glandular base, sharply doubly serrate above, with straight glandular teeth, and divided above the middle into 4 or 5 pairs of spreading acuminate lobes, more than half-grown when the flowers open from the 10th to the middle of May, and then covered above with short white hairs and glabrous below, and at maturity membranaceous, dark green and scabrate on the upper and pale on the lower surface, 5–6 cm. long and 4–4.5 cm. wide, with slender midribs, and thin veins arching obliquely to the points of the lobes, turning yellow or greenish-yellow before falling early in October; petioles slender, grooved on the upper side, slightly wing-margined at the apex, at first glandular, with minute dark red stipitate caducous glands, 2.5–3 cm. in length. *Flowers* 2 cm. in diameter, on slender glabrous pedicels, in compact 3–12- mostly 6–10-flowered corymbs; calyx-tube narrowly obconic, the lobes slender, acuminate, entire or occasionally sparingly toothed, glabrous or puberulous near the apex, reflexed after anthesis; stamens 8–10; anthers light rose color; styles 2–4, surrounded at the base by a broad ring of hoary tomentum. *Fruit* ripening early in September and soon falling, or rarely persistent and shrivelling on the branches, on slender elongated pedicels, in drooping clusters, oblong to subglobose or ovate-oblong, mostly concave at the ends, scarlet more or less blotched with russet, slightly glaucous,

1.2–1.5 cm. long and 1.1–1.3 cm. wide; calyx little enlarged, with a deep cavity and closely appressed usually persistent lobes red above toward the base; flesh thin, yellow, occasionally slightly tinged with red, sweet, rather juicy; nutlets 3 or 4, gradually narrowed and rounded at the ends, 5–6 cm. long and 3–4 mm. wide.

A bushy tree occasionally 3 m. high, with a short trunk 12–14 cm. in diameter covered with light gray scaly bark, numerous ascending flexuose gray branches forming a round-topped head, and slender nearly straight branchlets marked by small pale lenticels, orange-brown when they first appear, dark reddish-brown during their first year and dull gray the following season, and armed with slender straight or slightly curved bright red-brown lustrous ultimately ashy-gray spines 2.5–5 cm. in length, becoming branched on large stems.

Berks county: Banks of streams, near Kutztown, *C. L. Gruber* (No. 9), 1901, May and September, 1903.

14. *Cratægus longipetiolata* n. sp.

Leaves broadly ovate to oval, full and rounded to truncate or concave-cuneate at the broad base, coarsely doubly serrate, with straight glandular teeth, and slightly divided into 4 or 5 pairs of small acuminate lobes, about half-grown when the flowers open the middle of May and then very thin, light yellow-green and slightly roughened above by short white hairs, pale and glabrous below, and at maturity thin, light yellow-green, and nearly smooth on the upper and pale on the lower surface, 5–6 cm. long and 4.5–5 cm. wide, with thin yellow midribs, and slender primary veins extending obliquely to the points of the lobes; petioles very slender, slightly grooved on the upper side, sparingly or not at all glandular, often 3.5–4 cm. in length. *Flowers* 1.6–1.8 cm. in diameter, on slender glabrous pedicels, in 5–10-flowered narrow compact corymbs, their bracts and bractlets deciduous before the flowers open; calyx-tube broadly obconic, the lobes slender, elongated, acuminate, entire or occasionally slightly serrate near the middle; stamens 6–9; anthers red; styles usually 3 or 4, surrounded at the base by a broad ring of long white hairs. *Fruit* ripening the middle of September, on slender drooping pedicels, in few-fruited clusters, oblong-obovate, dark red, lustrous, 9–12 mm. long; calyx little enlarged, with a narrow shallow cavity and spreading lobes, their tips deciduous from the ripe fruit; flesh thin and yellow; nutlets usually 3, rounded at the base, gradually narrowed to the rounded apex, slightly grooved on the back, about 7 mm. long and 4–5 mm. wide.

A branching shrub, with erect stems 3–4 m. high and 5–6 cm. in diameter, spreading into thickets, and slender nearly straight branch-

lets marked by numerous small dark lenticels, dark orange color and lustrous when they first appear, becoming dark orange-brown during their first winter and light gray-brown the following year, and armed with few slender slightly curved light red-brown spines 2–2.5 cm. in length.

Bucks county: Borders of rich woods, near Sellersville, *C. D. Fretz* (No. 178, type!), May and September, 1903.

15. *Crataegus insolita* n. sp.

Leaves oblong-ovate, rounded or occasionally cuneate at the broad entire base, coarsely doubly serrate above, with straight gland-tipped teeth, and divided into 4 or 5 pairs of short acuminate spreading lobes, less than half-grown when the flowers open about the middle of May and then membranaceous, light yellow-green and covered above with short white hairs, and pale and glabrous below, and at maturity thin but firm in texture, glabrous, dark yellow-green on the upper and pale on the lower surface, 6–8 cm. long and 5–6 cm. wide, with stout yellow midribs, and thin primary veins extending very obliquely to the points of the lobes; petioles stout, slightly grooved on the upper side, sparingly villose at first, soon glabrous, slightly glandular, with minute caducous glands, and 3–4 cm. long; stipules linear-lanceolate, acuminate, glandular, with minute stipitate glands, fading pink, caducous; leaves on vigorous shoots becoming subcoriaceous, full and rounded or occasionally slightly cuneate at the base, more coarsely serrate and often 8–9 cm. wide and long, with stout petioles wing-margined at the apex and 3–4 cm. in length. *Flowers* about 1–2 cm. in diameter, on slender glabrous pedicels, in broad mostly 10–12-flowered corymbs, with oblong-obovate acuminate coarsely glandular-serrate bracts and bractlets mostly persistent until after the flowers open; calyx-tube narrowly obconic, reddish, the lobes linear, long-acuminate, entire or occasionally sparingly serrate, reflexed after anthesis; stamens 10 or less, usually 5–8; anthers dark rose color; styles 2–4, surrounded at the base by a narrow ring of hoary tomentum. *Fruit* ripening at the end of September, on long stout pedicels, in drooping few-fruited clusters, broad ovate, bright cherry red, marked by many large dark dots, 1.3–1.5 cm. long and 1.2–1.3 cm. wide; calyx little enlarged, with a narrow deep cavity, and elongated mostly entire closely appressed lobes gradually narrowed from broad bases; flesh thick, pale yellow, and somewhat juicy; nutlets usually 3 or 4, broad and rounded at the base, gradually narrowed to the rounded apex, prominently ridged on the back, with a high narrow ridge, 7–8 cm. long and about 5 mm. wide.

A shrub 3–5 m. high, often forming thickets, with stout ascending

stems covered with ashy-gray bark, and thick slightly zigzag branchlets marked by oblong pale lenticels, dark orange-green when they first appear, light orange or reddish-brown and lustrous during their first winter, light gray-brown the following year, and armed with numerous stout curved or rarely straight red-brown shining spines 3.5–5 cm. in length.

Delaware county: Collen Brook, Upper Darby, *Smith* and *Sargent* (No. 216, type!), September, 1902; *B. H. Smith*, May and September, 1903, May, 1904; Lownes' Run, Springfield, *B. H. Smith* (No. 203), May and June, 1902, May, 1904; Collen Brook, Upper Darby, *B. H. Smith* (No. 240), May, 1904.

16. *Cratægus stolonifera* Sargent.

Bot. Gazette, XXXV, 109 (The Genus *Cratægus* in New Castle County, Delaware) (1903).

Leaves ovate-oblong, acuminate, rounded, truncate or sometimes especially on leading shoots cordate at the broad base, more or less deeply divided into 4 or 5 pairs of acute or acuminate lobes, coarsely and often doubly serrate, with straight or incurved glandular teeth, as they unfold suffused with red and villose above, with long pale caducous hairs, and at maturity thin but firm in texture, glabrous, dark yellow-green on the upper, pale on the lower surface, 4.5–6 cm. long, 3–4 cm. wide, with slender midribs slightly impressed above, 4 or 5 pairs of remote primary veins extending to the points of the lobes, and very indistinct veinlets; petioles slender, slightly grooved, at first glandular, with numerous small dark deciduous glands, often red below the middle, 1.5–2 cm. long; stipules linear, acuminate, finely serrate, bright red, caducous. *Flowers* appearing from the 10th to the middle of May, 1.5 cm. in diameter, in compact mostly 5–10-flowered thin-branched glabrous corymbs, with oblong-obovate to linear, acuminate, finely glandular-serrate, bright red, caducous bracts and bractlets; calyx-tube narrowly obconic, the lobes acuminate, entire or slightly serrate toward the apex, often red toward the base, reflexed after anthesis; stamens 5–7; anthers small, dark red tinged with purple; styles 3 or 4, surrounded at the base by a narrow ring of pale tomentum. *Fruit* ripening early in September and soon falling, in few-fruited drooping clusters, usually on short pedicels, subglobose to short-oblong, scarlet, lustrous, 1.2–1.3 cm. long; calyx-cavity broad and shallow, the lobes gradually narrowed from broad bases, acuminate, mostly entire or sparingly serrate, red on the upper side toward the base, closely appressed; flesh yellow, thick and succulent; nutlets 3 or 4, thick, narrow and acute at

the ends, prominently ridged on the back, with a thin high ridge, 7–8 mm. long.

A shrub 2–3 m. tall, with numerous stems spreading into broad thickets, and slender slightly zigzag branchlets olive-green tinged with red when they first appear, dull red-brown during their first and olive-green during their second year, and armed with numerous stout slightly grooved bright chestnut-brown spines 3–5 cm. long.

Delaware county: Preston Run Barrens, Newtown, *B. H. Smith* (No. 223), October, 1902, May and October, 1903; Lownes' Run, Springfield, *B. H. Smith* (No. 230), May and September, 1903. Bucks county: Meadow at Pleasant Spring bridge, Hilltop near Sellersville, *C. D. Fretz* (No. 107), September, 1899, May, 1900; *Fretz and Sargent*, September, 1902; near South Perkasio, *C. D. Fretz* (No. 175), May and September, 1903. Also in New Castle county, Delaware.

17. *Cratægus modica* n. sp.

Leaves ovate, acuminate, rounded, cuneate or occasionally nearly truncate at the entire often glandular base, finely doubly serrate above, with slender glandular teeth, and divided into 4–6 pairs of narrow acuminate spreading lateral lobes, nearly fully grown when the flowers open about the middle of May and then very thin, light yellow-green and hairy above, with short soft white hairs, and pale and glabrous below, and at maturity membranaceous, glabrous, yellow-green, smooth and lustrous on the upper and pale on the lower surface, 2.5–4 cm. long and 2–3.5 cm. wide, with thin yellow midribs, and slender primary veins arching obliquely to the points of the lobes; petioles very slender, at first reddish and puberulous, soon glabrous, sparingly glandular, 1.5–2.5 cm. in length. *Flowers* about 1.5 cm. in diameter, on slender glabrous pedicels, in compact 5–7-flowered corymbs, with linear bracts and bractlets mostly deciduous before the flowers open; calyx-tube narrowly obconic, the lobes slender, acuminate, usually entire or slightly toothed above the middle, tipped with minute dark glands, reflexed after anthesis; stamens 7–8; anthers rose color; styles 3 or 4, surrounded at the base by a narrow ring of pale tomentum. *Fruit* ripening early in September, on stout pedicels, in few-fruited clusters, globose, bright crimson, lustrous, 8–10 mm. in diameter; calyx little enlarged, with a wide shallow cavity and lobes usually deciduous from the ripe fruit; flesh orange color, sweet, soft and pulpy; nutlets 3 or 4, gradually narrowed and rounded at the ends, prominently ridged on the back, with a high grooved ridge 5–7 mm. long and 4–5 mm. wide.

A shrub 1–1.5 m. high and broad, with stout contorted grayish-brown stems, and slender nearly straight branchlets marked by small oblong

pale lenticels, light red-brown and slightly puberulous when they first appear, soon glabrous, dark red-brown and rather lustrous during their first winter and light gray-brown the following season, and armed with slender slightly curved red-brown lustrous spines often 4 cm. long on young branches, and on old stems very stout, gray-brown and frequently not more than 3 cm. in length.

Bucks county: Meadows near the brook, in low moist soil, at Pleasant Spring, Hilltop near Sellersville, *Fretz* and *Sargent* (No. 109, type!) September, 1899; *C. D. Fretz*, May, 1900. Rare.

18. *Cratægus vittata* Ashe.

Jour. Elisha Mitchell Sci. Soc., Vol. XX, p. 50, 1904.

Leaves ovate to oblong-ovate, acuminate and often long-pointed at the apex, rounded, truncate or rarely cuneate at the broad entire or crenate base, sharply double serrate above, with straight glandular teeth, and more or less divided into 3 or 4 pairs of broad acuminate lobes; nearly half-grown when the flowers open during the first week of May and then membranaceous, light yellow-green and glabrous or sparingly villose especially on the midribs above, pale and glabrous below, and at maturity thin, dark yellow-green and lustrous on the upper, pale on the lower surface, 7–8 cm. long and 5.5–6.5 cm. wide, with stout midribs, and conspicuous primary veins arching obliquely to the points of the lobes; petioles stout, furnished with occasional dark glands, glabrous, and 3–4 cm. in length; stipules lanceolate sometimes falcate, glandular, caducous. *Flowers* 1.5–2 cm. in diameter, on stout elongated glabrous pedicels, in broad lax, usually 7–12-flowered corymbs, with linear glandular caducous bracts and bractlets; calyx-tube broadly obconic, the lobes short, slender, entire or sinuate-toothed near the middle, reflexed after anthesis; stamens 5–10, generally 8–10; anthers reddish-purple; styles 3–5, mostly 3 or 4, surrounded at the base by a ring of long white hairs. *Fruit* ripening early in September and falling gradually before the leaves, on elongated pedicels, in drooping few-fruited clusters, depressed-globose to short-oblong, scarlet, usually blotched with green, covered with a slight glaucous bloom, 1.3–1.5 cm. in diameter; calyx enlarged, with a broad shallow cavity, and spreading lobes mostly deciduous from the ripe fruit; flesh thick and pulpy, acid, yellow-orange, sweetish; nutlets 3 or 4, narrowed and rounded at the base, acute at the apex, prominently ridged on the back, with a high grooved ridge, 6–7 mm. long and 4 mm. wide.

A tree-like shrub 2–3 m. high, with a short stem covered with dark gray scaly bark, small branches forming a broad round-topped head, and stout nearly straight branchlets marked by small pale lenticels,

dark red-brown during their first season and ultimately dark brown or gray-brown, and armed with numerous stout straight or slightly curved bright red-brown shining spines 6–7 cm. in length.

Berks county: Borders of oak woods, in gravelly soil, near Robesoniana, North Heidelberg township, *C. L. Gruber* (No. 14), May and September, 1900.

19. *Crataegus sequax* Ashe.

Jour. Elisha Mitchell Sci. Soc., Vol. XX, p. 40, 1904.

Leaves ovate, acuminate and often long-pointed at the apex, rounded, truncate or occasionally slightly cordate at the broad entire base, sharply doubly serrate above, with slender straight glandular teeth, and more or less divided into numerous narrow acuminate lateral lobes, more than half-grown when the flowers open about the 10th of May and then covered above with soft white hairs and pale and glabrous below, and at maturity membranaceous, dark yellow-green, glabrous and very smooth on the upper and pale and conspicuously reticulate-venulose on the lower surface, 3–4.5 cm. long, 2.5–4 cm. wide, with thin midribs and slender veins extending obliquely to the points of the lobes; petioles slender, grooved on the upper side, slightly wing-margined at the apex, tinged with red, glandless or sparingly glandular, 1.5–2.5 cm. in length; leaves on vigorous shoots cuneate or cordate at the base, more deeply lobed and often deeply cleft, with stout broadly winged conspicuously glandular petioles. *Flowers* 1.8–2.1 cm. in diameter, on slender glabrous pedicels, in 5–9-flowered compact corymbs with linear glandular bracts and bractlets, fading red, mostly deciduous before the flowers open; calyx-tube broadly obconic, the lobes gradually narrowed from wide bases, entire or sparingly minutely serrate, glabrous or slightly pubescent toward the apex, reflexed after anthesis; stamens 5–10, frequently 8; anthers purple; styles 3–5, usually 3 or 4, surrounded at the base by a narrow ring of hoary tomentum. *Fruit* ripening about the 20th of September and falling gradually during several weeks, on slender pedicels, in few-fruited drooping clusters, globose to depressed-globose or rarely to oblong-globose, occasionally slightly tapering toward the base, dark crimson to cardinal, usually mottled with russet or orange, covered with a glaucous bloom, 1.2–1.5 cm. in diameter; calyx much enlarged, with a broad shallow cavity, and spreading and reflexed or erect lobes dark red on the upper side below the middle, their tips often deciduous from the ripe fruit; flesh thick, soft and juicy, orange color often tinged with red; nutlets usually 3 or 4, rounded at the narrow ends, ridged on the back, with a broad deeply grooved ridge, 7–8 mm. long and about 4 mm. wide.

A tree sometimes 4 m. high, with a short trunk 25 to 30 cm. in diameter covered with dark red bark separating into large thin scales, numerous stout ascending gray branches forming a round-topped head, and slender nearly straight branchlets marked by many small circular pale lenticels, light reddish-brown when they first appear, reddish-brown or purplish and often covered with a glaucous bloom during their first year, and gray-brown the following season, and armed with numerous slender straight or slightly curved light chestnut-brown shining spines 3–5 cm. in length, becoming on the upper part of the trunk and on the base of the large branches compound and many-branched.

Berks county: Low moist soil, in the neighborhood of swamps, on Sacony creek, near Kutztown, *C. L. Gruber* (No. 25), 1901, September, 1902, May, 1903 (No. 108 with 5–8 stamens).

V.—MOLLES.

Stamens 10; anthers white, 1. *C. tatnalliana*.
Stamens 5 or 6; anthers pink, 2. *C. digna*.

1. *Cratægus tatnalliana* Sargent.

Bot. Gazette, XXXV, 106 (The Genus *Cratægus* in New Castle County, Delaware) (1903).

Leaves ovate to oval, acute, broadly cuneate, or on leading shoots rounded or rarely cordate at the entire base, divided above into short acute lobes, and coarsely and usually doubly glandular-serrate; as they unfold light green and covered above with short lustrous white hairs, rather paler below and villose along the midribs and primary veins, and at maturity membranaceous, dark yellow-green and scabrate on the upper and paler and glabrous on the lower surface with the exception of a few scattered hairs on the slender yellow midribs and 5 or 6 pairs of thin primary veins extending to the points of the lobes, 8–10 cm. long and 5.5–6 cm. wide; petioles slender, at first villose-pubescent, soon glabrous or rarely puberulous at maturity, 2.5–3 cm. long; stipules spatulate, acute, conspicuously glandular-serrate, caducous, or on vigorous shoots foliaceous, full and rounded below, and acuminate at the apex. *Flowers* opening during the first week in May, 2 cm. in diameter, in compact ultimately lax slender-branched many-flowered compound corymbs, with foliaceous, oblong-obovate bracts and bractlets, acute or short-pointed at the apex, and coarsely serrate, with glandular teeth; calyx-tube broadly obconic, thickly coated like the short slender pedicels with long white hairs, the lobes acuminate, serrate, with elongated teeth tipped with red glands, dark green, slightly puberulous particularly along the lower side of the prominent midvein; stamens 10; anthers large, white, styles 3 or 4, surrounded at the base by a broad

ring of white tomentum. *Fruit* ripening from the middle to the end of August, in few-fruited drooping puberulous corymbs, globose, obovate or rarely oblong, full and rounded at the ends, bright orange-red, marked by large pale dots, puberulous toward the base, 1.5–2 cm. long, 1–2 cm. wide; calyx enlarged, with a broad deep cavity and lobes gradually narrowed from broad bases, acuminate, coarsely serrate usually only above the middle, puberulous, bright red on the upper side toward the base, closely appressed or rarely erect and incurved; flesh thick, yellow, dry and mealy; nutlets 3 or 4, thin, acute at the narrow ends, very irregularly ridged on the rounded back, 7–8 mm. long and 4–5 mm. wide.

A shrub 4–5 m. high, with numerous stout stems forming a broad head, and thick slightly zigzag branchlets at first villose, soon glabrous, dark red-brown, lustrous and marked by numerous large oblong white lenticels during their first season, ashy-gray and lustrous during their second year and ultimately darker, and armed with stout straight or slightly curved bright chestnut-brown shining spines 4–5 cm. long.

Chester county: Along Brandywine creek below Sager's Mill, *W. M. Canby* (No. 4), October, 1902, May and September, 1903. Philadelphia county: Bartram's Garden, *A. MacElwee* (Nos. 72A and 76, Herb. Philadelphia Museums), May, 1899, June, 1901; *B. H. Smith*, 1903. De'aware county: Preston Run Barrens, Newtown, *B. H. Smith* (No. 222), May, 1903. Berks county: *C. L. Gruber* (No. 129), 1902, May and August, 1903. Also in New Castle county, Delaware.

It is interesting to find that this common Delaware species was probably known to John Bartram, as the old specimen in his garden, judging from its size and age, may have been planted there during his lifetime.

2. *Cratægus digna* n. sp.

Leaves broadly ovate, acute or acuminate, full and rounded or concave-cuneate at the wide entire base, coarsely doubly serrate above, with straight glandular teeth, and slightly divided into 4 or 5 pairs of short acute lateral lobes, less than one-third grown when the flowers open during the first week of May and then coated above with soft white hairs and villose below along the midribs and veins, and at maturity thin, yellow-green and sparingly short-pubescent or glabrate on the upper, paler and still slightly hairy on the lower surface along the thin midribs and in the axils of the slender primary veins arching obliquely to the points of the lobes, 7–8 cm. long and 6–7 cm. wide; petioles slender, grooved on the upper side, at first villose, becoming glabrous or nearly glabrous, sparingly glandular with minute often persistent glands, 1.5–4 cm. long. *Flowers* 1.5–2.2 cm. in diameter, on stout

densely villose pedicels, in wide 6-12-flowered villose corymbs, with linear glandular bracts and bractlets mostly deciduous before the flowers open; calyx-tube narrowly obconic, coated toward the base with long matted white hairs, the lobes gradually narrowed, acuminate, coarsely glandular-serrate, puberulous on the outer and villose on the inner surface, red toward the apex, reflexed after anthesis; stamens 5 or 6; anthers pink or light rose color; styles 5, surrounded at the base by a narrow ring of pale tomentum. *Fruit* ripening at the end of August and soon falling, on slender slightly hairy reddish pedicels, in drooping usually many-fruited clusters, globose to rarely pyriform-globose or oblong-globose, concave at the base, concave or flattened at the apex, pubescent or puberulous at the ends, scarlet, dotted with yellow or orange, 1.2-1.4 cm. in diameter; calyx little enlarged, with a wide shallow cavity, and spreading incurved coarsely serrate lobes covered above with short white hairs and dark red toward the base on the upper side; flesh thick, dark yellow, soft, sweetish acid; nutlets 5, gradually narrowed and acute at the ends, slightly grooved on the back, 7-8 mm. long and about 4 mm. wide.

A tree 4-6 m. high, with a short trunk sometimes 30 cm. in diameter, covered with dark gray bark separating into thin papery scales or often shrubby with two or three stems, long ascending flexuose branches forming a round-topped head, and stout nearly straight branchlets marked by small scattered pale lenticels, dark orange color and pubescent when they appear, soon becoming glabrous, dark reddish or purple-brown and lustrous during their first season, lighter-colored the following year and ultimately ashy-gray, and armed with numerous straight or slightly curved bright chestnut-brown shining spines 2.5-3 cm. in length, becoming elongated and much branched on old stems and branches.

Berks county: Borders of meadows, in low moist soil, near Kutztown, *C. L. Gruber* (Nos. 144, type!, and 19), 1902, May and September, 1903, (No. 207), August, 1904.

No. 184, *Fretz*, meadows near Sellersville, Bucks county, a tree now destroyed, with 8-10 stamens and rather smaller leaves more frequently cuneate at the base and often oblong-ovate, is doubtfully referred to this species.

VI.—FLABELLATÆ.

Flowers cup-shaped, less than 2 cm. in diameter, on puberulous or glabrous pedicels; anthers rose-purple; fruit narrow-oblong,

1. *C. holmesiana*.

Flowers not cup-shaped, 2 cm. or more in diameter, on villose pedicels; anthers light rose color or pink; fruit subglobose to short-oblong,

2. *C. arcuata*.

1. *Cratægus holmesiana* Ashe.

Jour. Elisha Mitchell Sci. Soc., XVI, pt. II, 78 (1900).—Sargent, Bot. Gazette, XXXI, 10; Silva N. Am., XIII, 111, t. 676; Man. 449, f. 366.

Bucks county: Banks of Perkiomen creek, Sellersville, *C. D. Fretz* (No. 2), May 12, 1896, (No. 18), May, 1899, (No. 32), July, 1899, (Nos. 34 and 35), August, 1899; *Fretz and Sargent*, September, 1899; *A. MacElwee* (Nos. 414 and 811, Herb. Philadelphia Museums), June, 1899, (No. 1,507), October, 1899, (No. 1,655), May, 1900. Berks county: Near Kutztown, *C. L. Gruber* (No. 4), 1901, May and September, 1903.

The Pennsylvania tree differs from *Cratægus holmesiana* as it usually occurs in New England and Canada in its puberulous or villose corymbs, pedicels and young branchlets, and in the hairs found on the under surface of the leaves particularly on the midribs and veins, and is the variety *villipes* Ashe (*Jour. Elisha Mitchell Sci. Soc.*, XVII, pt. II, 11, 1901) (*Cratægus villipes* Gruber, *Proc. Berks Co. Nat. Sci. Club*, I, 7) (*Cratægus in Berks County*, II) (1903).

2. *Cratægus arcuata* Ashe.

Ann. Carnegie Mus., I, pt. 3, 387 (1902).—Sargent, Bot. Gazette, XXXV, 108 (The Genus *Cratægus* in New Castle County, Delaware).—Gruber, *Proc. Berks County Nat. Sci. Club*, 7 (*Cratægus in Berks County*, II).

Leaves ovate to oval, acute, rounded or concave-cuneate at the entire base, coarsely doubly serrate above, with straight or recurved glandular teeth, and divided into short acute lateral lobes, about half-grown when the flowers open toward the first week of May and then light yellow-green and roughened above by short white hairs and sparingly villose below along the thin midribs and primary veins, and at maturity dark yellow and scabrate on the upper and paler and still slightly villose on the lower surface especially in the axils of the veins, 6–9 cm. long and 5–6 cm. wide; petioles slender, slightly grooved on the upper side, wing-margined toward the apex, at first villose-pubescent, becoming puberulous or nearly glabrous before autumn, sparingly glandular, 3–3.5 cm. in length; stipules linear, glandular, fading red, caducous; leaves on vigorous shoots sometimes subcordate at the base, more coarsely serrate, often deeply laciniately lobed, with slender acuminate lobes, 9–10 cm. long and 8–9 cm. wide, with stout winged petioles and foliaceous lunate coarsely serrate persistent stipules. *Flowers* 2–2.5 cm. in diameter, on slender villose pedicels, in wide many-flowered compound hairy corymbs, with linear acuminate glandular bracts and bractlets, fading red, and mostly deciduous before the flowers open; calyx narrowly obconic, glabrous, the lobes slender, elongated, coarsely glandular, with long-stalked glands, red toward the apex, glabrous on the outer, villose on the inner surface, reflexed after anthesis; stamens

5–8, usually 5; anthers light rose color or pink; styles 3–5, surrounded at the base by a narrow ring of pale tomentum. *Fruit* ripening at the end of August and soon falling, on stout slightly villose pedicels, in few-fruited clusters, subglobose to short-oblong, full and rounded at the apex, concave and slightly hairy at the base, scarlet, lustrous, marked by large pale dots, 1.3–1.5 cm. long and 1.1–1.3 cm. wide; calyx slightly enlarged, with a narrow deep cavity, and laciniately serrate mostly incurved lobes generally persistent on the ripe fruit; flesh thick, yellow, rather juicy; nutlets usually 4, gradually narrowed and acute at the ends, slightly grooved or occasionally ridged on the back, with a low narrow ridge, about 8 mm. long and 4 mm. wide.

A tree 5–7 m. high, with a short trunk occasionally 10 cm. in diameter, or often a tall shrub, with small erect or ascending branches forming a narrow oblong head, and slender nearly straight branchlets marked by small pale lenticels, dark orange-green and slightly villose when they first appear, dull reddish-brown during their first year and finally ashy-gray, and armed with stout straight or slightly curved red-brown spines usually 3–4 cm. long and on old stems becoming elongated and much branched.

Borders of streams and meadows. Common. Berks county: *C. L. Gruber* (Nos. 5 and 168), 1901. Bucks county: *C. D. Fretz* (Nos. 135, 146 and 146A), May and September, 1901. Philadelphia county: *B. H. Smith*, Island road, Kingsessing (No. 209), May and September, 1902 and 1903. Delaware county: Lownes' Run, *B. H. Smith*, May, 1905. Also in New Castle county, Delaware.

VII.—COCCINEÆ.

Corymbs many-flowered; stamens 10 or less; anthers pale yellow; nutlets 2 or 3, obtuse at the ends, conspicuously rounded on the back.

Leaves subcoriaceous; fruit 1.2–1.5 cm. in diameter, 1. *C. coccinea*.

Leaves thin; fruit usually less than 1 cm. in diameter, 2. *C. dodgei*.

Corymbs few-flowered; stamens 20; anthers bright rose color; nutlets 5, acute at the ends, obscurely grooved on the back,

3. *C. evansiana*.

1. *Cratægus coccinea* Linnaeus.

Spec., I, 476 (1753).—Sargent, *Bot. Gazette*, XXXI, 11; *Silva N. Am.*, XIII, 133, t. 683; *Man.* 459, f. 375.

Berks county: Near Kutztown, *C. L. Gruber* (No. 197), 1903, May and September, 1904. Northampton county: *T. C. Porter*, May and August, 1894, June, 1896.

The specimens from Easton are quite glabrous and well represent the variety *rotundifolia* Sarg. (*Bot. Gazette*, XXXI, 14 [1900]; *Silva*

N. Am., XIII, 134; *Man.* 460), although those gathered by Mr. Gruber near Kutztown have slightly villose corymbs and thus approach the typical *Cratægus coccinea* L. with its extremely villose corymbs, calyx and young branchlets.

2. *Cratægus dodgei* Ashe.

Jour. Elisha Mitchell Sci. Soc., Vol. XIX, p. 26, 1903.

Cratægus gravesii Sargent, Rhodora, V, 159 (June, 1903).

Cratægus fallens Gruber, Proc. Berks County Nat. Sci. Club, I, 19 (*Cratægus* in Berks County, II) (October, 1903).

Leaves ovate to obovate, acute or rounded at the apex, narrowed from below the middle to the concave-cuneate or rarely rounded entire base, and slightly divided above the middle into 3 or 4 pairs of broad acute lobes; when they unfold tinged with red and coated above with silky white hairs, nearly fully grown when the flowers open about the 20th of May and then membranaceous, light green and slightly hairy above, with scattered pale hairs, and at maturity thin but firm in texture, glabrous, dark green and lustrous on the upper surface, pale yellow-green on the lower surface, usually 3.5–4 cm. long and 2.5–3 cm. wide, with slender yellow midribs, and 3 or 4 pairs of slender primary veins extending obliquely to the points of the lobes, or occasionally 3-nerved; petioles slender, more or less wing-margined at the apex, slightly hairy and often glandular early in the season, 1–1.4 cm. in length; leaves on vigorous shoots often broadly ovate, rounded, slightly cordate or broadly cuneate at the base, coarsely serrate and divided into numerous short acute lateral lobes, 5–6 cm. long and nearly as wide, with thick rose-colored midribs and stout winged petioles. *Flowers* 1.5–1.6 cm. in diameter, on slender slightly hairy or glabrous pedicels, in compact 5–16- mostly 10–12-flowered compound corymbs, with linear and acuminate to lanceolate, glandular, pink bracts and bractlets; calyx-tube narrowly obconic, light green, the lobes gradually narrowed from broad bases, linear, acuminate, tipped with bright red glands, finely glandular-serrate usually only above the middle, reflexed after anthesis; stamens 4–10, usually 7 or 8; anthers small, pale yellow; styles 2 or 3, rarely 4, surrounded at the base by a narrow ring of pale tomentum. *Fruit* in erect few-fruited compact clusters, globose or depressed-globose, dark orange-red, marked by numerous large dark dots, 7–11 usually about 8 mm. in diameter; calyx small with a broad shallow cavity, the lobes usually deciduous from the ripe fruit; flesh pale yellow-green, dry and mealy; nutlets 2 or 3, full and rounded at the ends, prominently ridged on the broad rounded back, about 6 mm. long and 4–5 mm. wide.

A shrub with several stout stems and a broad round-topped or flat-

tened head, 2-3 m. tall and broad, and slender, nearly straight or slightly zigzag branchlets marked by large pale lenticels, dark orange-green and slightly or densely villose or glabrous when they first appear, light red-brown and lustrous during their first season and dull gray-brown the following year, and armed with numerous slender nearly straight bright red-brown and shining ultimately ashy-gray spines 3-6 cm. in length.

Berks county: Near Kutztown, *C. L. Gruber* (No. 13), 1901, May and July, 1903, (No. 195), 1903, May and August, 1904. Bucks county: Meadows at California, *W. M. Canby*, May, 1900; *C. D. Fretz* (No. 123), May and September, 1900; *Fretz and Sargent*, September, 1902. Also from central and western New England to Ontario, eastern Michigan and western New York; rarely arborescent in southern New England.

3. *Crataegus evansiana* n. sp.

Leaves rhombic to ovate or rarely oval, acute or short-pointed and acuminate at the apex, gradually narrowed from near or above the middle to the concave-cuneate slender entire base, finely often doubly serrate above, with incurved teeth ending in minute dark glands, and irregularly divided toward the apex into short broad lobes, more than half-grown when the flowers open from the middle to the end of May and then membranaceous, dark yellow-green, very lustrous and slightly pubescent along the midribs above and dull, pale and glabrous below with the exception of large axillary tufts of white hairs, and at maturity coriaceous, glabrous, dark green, lustrous and very smooth on the upper and yellow-green on the lower surface, 4-5 cm. long and 3.5-4 cm. wide; petioles slender, grooved on the upper side, winged toward the apex, glandular, with small scattered dark red glands, villose, sometimes becoming nearly glabrous, and 2-3 cm. in length; stipules linear, glandular, bright scarlet, caducous; leaves on vigorous shoots broadly ovate to nearly orbicular, coarsely serrate, often three-lobed by deep narrow sinuses and 5-6 cm. wide, with stout conspicuously glandular petioles broadly winged nearly to the base and foliaceous lunate glandular-serrate persistent stipules. *Flowers* about 2 cm. in diameter, on slender elongated slightly villose pedicels, in compact 4-8- usually 5-flowered corymbs; calyx-tube narrowly obconic, glabrous, the lobes slender, acuminate, minutely glandular-serrate, tipped with dark red glands, glabrous on the outer, puberulous on the inner surface above the middle, reflexed after anthesis; stamens 20; anthers bright rose color; styles 5. *Fruit* ripening early in October, on stout reddish pedicels, in drooping clusters, subglobose to short-oblong, full and rounded at the apex, narrowed at the base, scarlet, about 1 cm. long; calyx

little enlarged, with a wide deep cavity and spreading closely appressed lobes mostly deciduous from the ripe fruit; flesh thin, greenish-yellow, dry and mealy; nutlets 5, gradually narrowed and acute at the ends, slightly grooved on the back, about 7 mm. long and 4 mm. wide.

A bushy tree about 5 m. high, with a short stem covered with furrowed dark brown scaly bark, stout ashy-gray branches wide-spreading on the ground and forming a round-topped head wider than high, and slender slightly zigzag branchlets orange color and deeply covered with matted pale hairs when they first appear and light red-brown and lustrous during their first winter, and armed with very slender, straight purplish spines, 2.5–4 cm. long.

A single tree near the tree of *Cratægus insueta* Sarg., on the lawn near the lake in West Fairmount Park, Philadelphia, of unknown origin, but probably planted, certainly North American and possibly indigenous. *W. Findlay* (No. 1,503A, Herb. Philadelphia Museums), October, 1899; *A. MacElwee* (No. 2,168A, Herb. Philadelphia Museums); *Canby* and *Sargent*, September, 1902; *Smith* and *Sargent*, September, 1904.

This handsome and very distinct species is named in memory of John Evans (1790–1862), a native of Radnor, Delaware county, where he established a garden long famous for its collections of rare trees and other plants (see *Smith, History of Delaware County, Pennsylvania*, 459; *Harshberger, Garden and Forest*, X, 182; also *Meehan, Garden and Forest*, X, 198, and *Harshberger, The Botanists of Philadelphia and Their Work*, 172).

VIII.—INTRICATÆ.

Anthers pale yellow.

Stamens 10 or less.

Fruit subglobose to short-oblong.

Corymbs and pedicels villose; leaves scabrate.

Leaves ovate-oblong; fruit yellow with a red cheek, hairy at the ends, 1. *C. modesta*.

Leaves ovate to rhombic or oval; fruit greenish-orange, not hairy, 2. *C. abjecta*.

Corymbs and pedicels glabrous; leaves ovate to oval.

Leaves scabrate; fruit dark crimson blotched with green, 3. *C. bartoniana*.

Leaves smooth.

Fruit orange to reddish-orange, 4. *C. neo-canbyi*.

Fruit green, becoming dark clear red when fully ripe, 5. *C. nemoralis*.

Leaves oblong-ovate.

Fruit dark orange or reddish-orange; leaves yellow-green, 6. *C. saxatilis*.

Fruit red or orange-red; leaves blue-green, 7. *C. fatida*.

Fruit oblong-obovate, green, more or less blotched with red; leaves oblong to oval, smooth, yellow-green,

8. *C. apposita*.

Stamens 10-18; corymbs and pedicels glabrous; leaves oval to ovate; fruit globose to depressed-globose, dark red, . . . 9. *C. reses*.

Anthers pale pink or rose color.

Stamens 10 or less (rarely 13 in No. 10).

Fruit subglobose to short-oblong.

Leaves yellow-green.

Leaves ovate to oval.

Leaves gradually narrowed into a long cuneate base; stamens 8-13, usually 10; fruit green-bronze to red-bronze color, 1.2-1.4 cm. in diameter, 10. *C. inducta*.

Leaves full and rounded at the broad base; stamens 6-8; fruit green or bronze-yellow, about 1 cm. in diameter,

11. *C. definita*.

Leaves oval to obovate or rhombic; stamens 8-10; fruit orange or orange-red, 12. *C. painteriana*.

Leaves blue-green, oval; fruit orange-red or red-bronze color,

13. *C. fulva*.

Fruit obovate.

Fruit dark crimson; leaves oval, usually lobed only on vigorous shoots; anthers cream color faintly tinged with pink, 14. *C. pygmaea*.

Fruit reddish-orange color; leaves oval to oblong-ovate, more or less lobed; anthers light purple, 15. *C. infera*.

Anthers red; stamens 10; fruit oblong, dark red; leaves rhombic to obovate, yellow-green, 16. *C. schweinitziana*.

Flowers unknown; fruit short-oblong to depressed-globose, bright canary yellow; leaves oblong-ovate, 17. *C. darlingtoniana*.

1. *Cratægus modesta* Sargent.

Rhodora, III, No. 26, 28 (1901).

Cratægus premora Ashe, Ann. Carnegie Mus., I, pt. 3 (1902).—Gruber, Proc. Berks County Nat. Sci. Club, I, 3 (*Cratægus* in Berks County, II).

Leaves ovate-oblong, acute, cuneate, rounded or on leading shoots truncate or slightly cordate or abruptly narrowed at the base, sharply doubly serrate, with minute glandular spreading teeth, and divided into numerous short broad acute lobes or occasionally 3-lobed by the greater development of the lowest pair, in the early spring bronze color, hirsute above, with short white hairs and villose below, and at maturity thick and firm in texture, dark yellow-green and scabrous on the upper surface, pale and pubescent below along the slender often light-red mid-ribs and 2 or 3 pairs of prominent veins, or scabrous over the lower surface of the leaves of vigorous shoots, 5-7 cm. long and 3.5-6 cm. wide; petioles more or less winged above, villose, glandular, often red, and 2-3 cm. in length. *Flowers* opening late in May, 1.8-2.5 cm. in

diameter, on short stout hairy pedicels, in compact 3–6-flowered villose corymbs; the bracts and bractlets lanceolate, conspicuously glandular-serrate, with stipitate large dark glands; calyx-tube broadly obconic, villose, the lobes lanceolate, glandular-serrate, coated with matted pale hairs; stamens 10; anthers large, pale yellow; styles 3, surrounded at the base by tufts of matted white hairs. *Fruit* erect on short villose pedicels, subglobose and flattened at the ends to short-oblong or obovate, 1–1.2 cm. long and 8–9 mm. wide, bright yellow, or orange with a red cheek, marked by numerous large dark spots, hairy at the ends; calyx high and prominent with a broad deep cavity, the lobes small, linear-lanceolate, glandular-serrate, spreading, mostly deciduous; flesh thick, light yellow, sweet, dry and mealy; nutlets 3, broad, rounded and obtuse at the ends, conspicuously ridged on the back, with a broad thick grooved ridge, 6–7 mm. long and 4–5 mm. wide.

A shrub, with numerous much-branched slender stems 2–3 m. high, and slender branchlets bright chestnut-brown and lustrous during their first season, later becoming dull gray-brown, and armed with thin straight spines $\frac{3}{4}$ –1 $\frac{1}{2}$ inches long.

Berks county: Near Kutztown, *C. L. Gruber* (No. 49), 1902; *Gruber* and *Sargent*, October, 1904. Also western New England, from Vermont to Connecticut, and in eastern New York.

2. *Crataegus abjecta* n. sp.

Crataegus biltmoriaana Small, Porter, Fl. Penn., 177 (not Beadle) (1903).

Leaves ovate to rhombic or oval, acute or acuminate at the apex, gradually or abruptly narrowed and cuneate at the glandular base, finely doubly serrate above, with straight gland-tipped teeth, and slightly divided above the middle into short broad acute lobes, more than half-grown when the flowers open during the first week of June and then thin, light yellow-green and roughened above by short white hairs and pale and slightly hairy below along the midribs and veins, and at maturity subcoriaceous, dark bluish-green and scabrate on the upper and pale and still slightly villose on the slender midribs and veins on the lower surface, 4–6 cm. long and 2.5–4.5 cm. wide; petioles stout, deeply grooved on the upper side, wing-margined sometimes nearly to the base, conspicuously glandular, slightly villose early in the season, becoming glabrous, 1–2 cm. in length; leaves on vigorous shoots broadly ovate to oblong-ovate, often rounded at the base, sometimes 3-lobed by deep narrow sinuses, and 5–6 cm. long and broad, with stouter broadly winged petioles 1.5–2 cm. long. *Flowers* about 2 cm. in diameter, on slender elongated pedicels, sparingly covered with long white hairs, in compact usually simple mostly 5–7-flowered corymbs,

with large laciniate glandular-viscid reddish bracts and bractlets persistent until the flowers open; calyx-tube broadly obconic, slightly hairy toward the base, the lobes wide, acuminate, laciniately divided and glandular above the middle, glabrous on the outer and villose on the inner surface; stamens 10; anthers light yellow; styles 3 or 4, surrounded at the base by a narrow ring of long white hairs. *Fruit* ripening about the middle of September and remaining on the branches until after the leaves have fallen, on short stout slightly villose pedicels, in erect or spreading few-fruited clusters, subglobose, often slightly longer than wide, greenish-orange and about 1.5 cm. in diameter; calyx enlarged, with a broad shallow cavity, and foliaceous coarsely serrate lobes conspicuous on the half-grown fruit but mostly deciduous before its maturity; flesh thin, hard and green; nutlets usually 3, full and rounded at the ends, ridged on the back with a broad high deeply grooved ridge, reddish-brown, about 7 cm. long and 5 cm. wide.

A shrub 1–2 m. high, spreading into broad thickets, with slender slightly zigzag branchlets marked by occasional oblong pale lenticels light orange color and slightly villose when they first appear, bright chestnut-brown or purplish and very lustrous during their first winter and dark dull brown tinged with red the following year, and armed with numerous slender nearly straight purplish or red-brown shining spines 2.5–5 cm. long.

Bucks county: Roadside at Pleasant Spring bridge, Hilltop near Sellersville, *C. D. Fretz* (No. 108, type!), June and October, 1899, and 1901; near Perkasio, *C. D. Fretz* (No. 157), June and October, 1901.

3. *Cratægus bartoniana* n. sp.

Leaves ovate to oval, acute, concave-cuneate at the glandular base, coarsely doubly serrate above, with straight glandular teeth, and deeply divided above the middle into 3 or 4 pairs of broad acute or acuminate lobes, nearly fully grown when the flowers open during the last week in May and then membranaceous, light yellow-green and roughened above by minute short white hairs and pale and glabrous below, and at maturity thick and firm in texture, dark bluish-green and scabrate on the upper and pale on the lower surface, 5–6.5 cm. long and 3.5–5 cm. wide, with stout midribs and thin primary veins arching obliquely to the points of the lobes, turning dull orange-red in the autumn before falling; petioles slender, grooved on the upper side, more or less wing-margined toward the apex, glandular while young, with mostly deciduous glands, reddish in the autumn, and 1.5–2 cm. in length; stipules linear, acuminate, glandular, generally deciduous before the flowers open; leaves on vigorous shoots broadly ovate, some-

times rounded or almost truncate at the broad base, more deeply lobed and more coarsely serrate and often 6 cm. long and wide, with stout broad-winged petioles. *Flowers* 1.5–1.7 cm. in diameter, on stout elongated glabrous pedicels, in 4–7-flowered simple corymbs, with large oblong-obovate to lanceolate glandular bracts and bractlets persistent until after the petals have fallen; calyx-tube broadly obconic, the lobes slender, acuminate, separated by wide sinuses, minutely glandular-serrate and reflexed after anthesis; stamens 10; anthers yellow; styles 3 or 4. *Fruit* ripening early in October, on stout elongated erect pedicels, solitary or in few-fruited clusters, subglobose to short-oblong, full and rounded at the ends, dark crimson often blotched with green, 1–1.2 cm. in diameter; calyx little enlarged, with a wide deep cavity, and spreading appressed lobes mostly persistent on the ripe fruit; flesh thin, green, dry and mealy; nutlets 3 or 4, full and rounded at the ends, ridged on the back, with a broad often doubly grooved ridge, about 7 mm. long and 4–5 mm. wide.

A shrub 1.5–2 m. high and rather broader than high, with stout intricately branched stems, and slender nearly straight branchlets dark orange color when they first appear, and dark reddish-brown or purplish and lustrous during their first winter, becoming dark red-brown the following year, and armed with stout straight purplish spines 3–4 cm. in length.

Philadelphia county: Gray's Ferry, on the Schuylkill river, *B. H. Smith* (No. 242, type!), May, 1904; *Smith and Sargent*, October 5, 1904; slope to the Schuylkill river, West Fairmount Park, *Smith and Sargent*, October, 1904.

This species is named in memory of Benjamin Smith Barton (1776–1815), and of his nephew, W. P. C. Barton (1786–1856), distinguished Philadelphia botanists.

4. *Cratægus neo-canbyi* n. sp.

Leaves oval to ovate, acute or acuminate, concave-cuneate at the entire or glandular base, finely often doubly serrate above, with incurved or straight gland-tipped teeth, and slightly divided above the middle into 2 or 3 pairs of short broad acute lobes, about half-grown when the flowers open during the last week of May and then membranaceous, glabrous with the exception of a few short hairs on the upper side of the midribs, light yellow-green and very smooth above and pale below, and at maturity thick to subcoriaceous, glabrous, dark yellow-green on the upper and pale or glaucous on the lower surface, 6–7 cm. long and 4–5 cm. wide, with stout orange-colored midribs and slender primary veins, turning deep orange color in the autumn before falling;

petioles stout, deeply grooved on the upper side, wing-margined sometimes nearly to the middle, glandular, 1.5–2 cm. in length; leaves on vigorous shoots broadly ovate, full and rounded at the wide base, coarsely serrate, more deeply lobed, 7–8 cm. long and 6–7 cm. wide, with stout broadly winged conspicuously glandular petioles. *Flowers* 1.5–1.7 cm. in diameter, on slender glabrous pedicels, in few rarely more than 5-flowered corymbs, with linear conspicuously glandular bracts and bractlets, fading brown and mostly persistent until after the petals have fallen; calyx-tube narrowly obconic, glabrous, the lobes gradually narrowed from the base, acuminate, coarsely glandular-serrate above the middle, glabrous on the outer and sparingly villose on the inner surface near the apex; stamens 10; anthers pale yellow; styles 5. *Fruit* ripening toward the middle of October and soon falling, on long stout erect pedicels, globose to short-oblong, flattened at the ends, somewhat angled, dull orange to reddish-orange color, marked by numerous large dark dots 1.2–1.5 cm. in diameter; calyx only slightly enlarged, with a narrow deep cavity and closely appressed lobes coarsely glandular-serrate above the middle and mostly persistent on the ripe fruit; flesh thick, green, dry and mealy; nutlets 5, full and rounded at the base, narrow and rounded at the apex, ridged on the back, with a broad high rounded ridge, about 7 mm. long and 5 mm. wide.

A shrub, with small spreading stems 1–3 m. high, and slender nearly straight branchlets marked by numerous large pale lenticels, dark orange color when they first appear and light reddish-brown during their first year, later becoming dark gray-brown, and armed with slender nearly straight bright purplish shining spines 2.5–4 cm. long.

Monroe county: Hillside between Stroudsburg and Tannersville, *W. M. Canby*, June 2, 1900; *Canby* and *Sargent*, October 12, 1900; *W. M. Canby*, May 30, 1902.

5. *Crataegus nemoralis* Sargent.

Bot. Gazette, XXXV, 104 (*Crataegus* in New Castle County, Delaware) (1903).

Leaves ovate to oval, acute, gradually or abruptly narrowed to the cuneate entire base, sharply mostly doubly serrate above, with incurved glandular teeth, and slightly divided above the middle into acute lobes, tinged with red when they unfold, and covered with long pale caducous hairs on the upper and pale blue-green and sparingly villose on the lower surface, glabrous when the flowers open about the middle of May, and at maturity thick and firm, dark yellow-green above, paler below, 4–5 cm. long and 3–4 cm. wide; petioles slender, slightly grooved, at first villose-pubescent, soon glabrous, glandular, with small scattered

dark persistent glands, 1.5–2 cm. long; stipules linear, lobed at the base, villose, coarsely glandular-serrate, like the inner bud-scales, often becoming bright red before falling; leaves on vigorous shoots broader, full and rounded at the base, and often deeply lobed. *Flowers* 1.4 cm. in diameter, on slender pedicels, in compact few-flowered glabrous compound corymbs, with oblanceolate to linear, acuminate, finely glandular-serrate bracts and bractlets, fading bright red; calyx-tube broadly obconic, glabrous, the lobes broad, acute or acuminate, laciniately glandular-serrate, reflexed after anthesis; stamens 10; anthers pale yellow; styles 3 or 4, surrounded at the base by a narrow ring of pale tomentum. *Fruit* erect, in few-fruited clusters, globose to subglobose or slightly obovate, about 1 cm. in diameter, dark green until late in the season, becoming dark clear red when fully ripe; calyx prominent, with a broad deep cavity, a short tube, and spreading mostly persistent acuminate lobes often serrate above the middle; flesh thin, greenish, dry and mealy; nutlets 3 or 4, thick, acute at the ends, prominently ridged on the back, with a broad often deeply grooved ridge, 7–8 mm. long and 4–5 mm. wide.

A tree-like shrub, with stems sometimes 3–4 m. high and stout zigzag branchlets, light olive-green and glabrous when they first appear, dark purple or reddish-brown and marked by numerous small oblong pale lenticels during their first season and dark gray-brown in their second year, and armed with many slender chestnut-brown or purple spines usually pointed toward the base of the branch and 5–6 cm. long.

Bucks county: Near Sellersville, Rockhill and Durham, *C. D. Fretz* (Nos. 4, 15, 108, 118, 121, 131, 148, 155), 1898–1901.

6. *Cratægus saxatilis* n. sp.

Leaves oblong-ovate, acute or acuminate, abruptly or gradually concave-cuneate at the glandular base, finely doubly serrate above, with straight teeth tipped with dark red glands, and divided above the middle into 3 or 4 pairs of short acute lobes, about half-grown when the flowers open from the 15th to the 20th of May and then membranaceous, light yellow-green above, pale below, and glabrous with the exception of occasional pale hairs on the upper side of the midribs, and at maturity thin and firm to subcoriaceous, dark yellow-green and smooth on the upper and paler on the lower surface, 5–6 cm. long and 3–4 cm. wide, with slender yellow midribs and thin primary veins arching obliquely to the points of the lobes, turning orange color or crimson and falling by the middle of October; petioles slender, grooved on the upper side, slightly wing-margined toward the apex, glandular, with numerous small dark mostly persistent glands, 1.5–2 cm. in length;

leaves on vigorous shoots broadly ovate, often full and rounded at the base, coarsely serrate, more deeply lobed, coriaceous, 5–6 mm. long and wide, with stout conspicuously glandular winged petioles sometimes not more than 1 cm. long. *Flowers* about 1.4 cm. in diameter, on slender elongated glabrous pedicels, in usually 6–8-flowered compound corymbs, with large oblong-obovate viscid bracts and bractlets conspicuously glandular with large long-stalked dark glands, fading rose color, persistent until after the petals have fallen; calyx-tube broadly obconic, the lobes large, acuminate, coarsely glandular-serrate above the middle, glabrous, reflexed after anthesis; stamens 5–10; anthers cream color; styles 3, surrounded at the base by a narrow ring of hoary tomentum. *Fruit* ripening toward the end of September and falling before the middle of October, on slender erect or spreading pedicels, in usually 2- or 3-fruited clusters, short-oblong, full and rounded at the apex, gradually narrowed to the base, dark orange or reddish-orange color marked by numerous large dark dots, 1–1.2 cm. long, 9–10 mm. wide; calyx enlarged and prominent, with a short tube, a wide deep cavity, and spreading lobes mostly persistent on the ripe fruit; flesh thin, greenish, dry and mealy; nutlets 3, rounded at the ends, irregularly ridged or grooved on the back, about 7 mm. long and 4–5 mm. wide.

A shrub usually about 1 m. high, with small dark-colored straggling stems, and slender branchlets marked by occasional dark lenticels, bright red-brown when they first appear, red-brown and lustrous during their first year, becoming dull and dark brown tinged with red, and armed with many slender nearly straight red-brown or purplish shining spines 3–5 cm. long.

Delaware county: Preston Run Barrens, Newtown, *B. H. Smith* (No. 218, type!), May and September, 1903; *Smith* and *Sargent*, September, 1902; *B. H. Smith* (No. 233), May, 1903.

7. *Crataegus foetida* Ashe.

Ann. Carnegie Mus., I, pt. 3, 389 (1902).—Gruber, Proc. Berks County Nat. Sci. Club, i, 5 (*Crataegus* in Berks County, II).

C. baxteri Sargent, Proc. Rochester Acad. Sci., IV, 107 (1903).

Glabrous with the exception of a few caducous hairs on the upper surface of the unfolding leaves and young petioles. *Leaves* oblong-ovate to oval, acuminate, concave-cuneate, rounded or on leading shoots sometimes truncate at the entire or crenulate base, finely doubly serrate above, with straight gland-tipped teeth, and divided into short broad acute lateral lobes; when they unfold furnished on the upper surface with a few long white caducous hairs, nearly fully grown

when the flowers open about the 20th of May and then membranaceous, nearly glabrous, dark yellow-green above, pale below, and at maturity smooth and coriaceous, dull dark bluish-green on the upper, and pale on the lower surface, slightly concave by the infolding of the margins, 4.5–6.5 cm. long, 4–6 cm. wide, with stout midribs deeply impressed on the upper side and usually rose-colored below late in the season, and 3–5 pairs of thin primary veins arching obliquely to the points of the lobes; petioles slender, more or less wing-margined at the apex, grooved, sparingly hairy early in the spring, glandular, with numerous small dark persistent glands, and 1.5–3 cm. in length. *Flowers* about 1.8 cm. in diameter, on short stout glabrous pedicels, in narrow compact 3–10- usually 5- or 6-flowered compound corymbs; with oblong-obovate, acuminate, very glandular, large and conspicuous bracts and bractlets, often deciduous before the flowers open; calyx-tube broadly obconic, the lobes gradually narrowed from wide bases, broad, acuminate, coarsely glandular-serrate, usually only above the middle, reflexed after anthesis; stamens 6–11, commonly 10; anthers large, pale yellow; styles 4 or 5; surrounded at the base by a broad ring of pale hairs. *Fruit* on short stout reddish pedicels, in few-fruited erect clusters, subglobose, flattened at the ends, concave at the base at the insertion of the stalk, cardinal or dark red sparingly blotched with russet to orange-bronze or reddish-bronze, about 1.5 cm. in diameter; calyx prominent, with a broad deep cavity, and wide lobes gradually narrowed into the long slender acuminate glandular-serrate reflexed and closely appressed tips often deciduous from the ripe fruit; flesh thin, hard and dry, greenish-yellow; nutlets 4 or 5, broad, obtuse at the narrowed ends, ridged and slightly grooved on the back, about 7 mm. long and 5 mm. wide.

An intricately branched shrub 3–4 m. high, with numerous stout stems covered with dark scaly bark, and erect and spreading branches forming a broad round-topped head, and slender only slightly zigzag branchlets, orange-green and marked by numerous large pale lenticels when they first appear, light red-brown and lustrous at the end of their first season, becoming light gray the following year, and armed with many slender or stout nearly straight bright red-brown shining spines 2.5–4 cm. in length.

Berks county: Near Kutztown, *C. L. Gruber* (No. 14), 1901, May and October, 1903; *C. L. Gruber* (No. 68), 1902, July, 1902, August and October, 1903; *Gruber and Sargent*, October, 1904.

The fruit of *Crataegus baxteri* from Rochester when fully ripe is bright orange-red, lustrous and marked by numerous large pale dots; that

of *Cratægus fætida* (No. 14) is described by Mr. Gruber as "dull mottled red-scarlet or bronze, ground color apparently a dark red-scarlet or orange-red usually much blotched with dark olive-green, often blotched, tinged or shaded with olive, light olive-green or dark red, sometimes with reddish-orange, rose or russet, punctate with greenish-orange or russet." In No. 68, which is evidently the same species, the fruit is described by him as "red-bronze to orange-bronze or light reddish-bronze, and not so much mottled or blotched, often very little blotched or not at all." Except in these slight variations in the color of the fruit I can find no differences between *Cratægus baxteri* and *Cratægus fætida*, which is thus widely distributed from western Massachusetts to western New York and eastern Pennsylvania.

8. *Cratægus apposita* Sargent.

Bot. Gazette, XXXV, 103 (The Genus *Cratægus* in New Castle County, Delaware) (1903).

Leaves oblong to oval, acute, acuminate or rarely round at the apex, cuneate at the base, glandular-serrate, above the middle usually doubly with spreading teeth, below, with small incurved teeth, or often entire near the base, slightly and irregularly lobed toward the apex, with short acute lobes; as they unfold coated above with soft pale deciduous hairs, when the flowers open the middle of May more than half-grown and then membranaceous and nearly glabrous, and at maturity thin but firm in texture, dark yellow-green on the upper, paler on the lower surface, 3.5–4 cm. long and 2–3 cm. wide, with slender 2–4 thin remote primary veins extending obliquely to the points of the lobes; petioles slender, wing-margined above, at first villose, soon glabrous, glandular, with small scattered dark red glands, often red toward the base, 1.5–2 cm. long; stipules oblong-obovate to linear, conspicuously glandular-serrate, caducous; leaves on vigorous shoots often ovate, acute, broadly cuneate and abruptly narrowed at the base into the wide wing of the short stout petiole, coarsely serrate, deeply 3–5-lobed, 5–6 cm. long and 4–6 cm. wide, with foliaceous lunate coarsely glandular-serrate stipules 7–10 mm. long. *Flowers* 1.5 cm. in diameter, on slender pedicels, in few usually 4–7-flowered corymbs, with oblong-obovate to linear conspicuously glandular-serrate bracts and bractlets, turning red before falling, caducous; calyx-tube broadly obconic, glabrous, the lobes gradually narrowed from broad bases, acute glandular-serrate, slightly hairy on the inner face, reflexed after anthesis; stamens 10; anthers pale yellow; styles usually 3. *Fruit* ripening the middle of October, in few-fruited drooping clusters, oblong-obovate, full and rounded at the apex, gradually narrowed below into the stout

pedicel, green until late in the season, then reddish or green more or less blotched with red, or occasionally when fully ripe light red or rarely yellowish-bronze color, 1–1.5 cm. long and 9–11 mm. wide; calyx-tube elongated, prominent, with a deep narrow cavity, and spreading and appressed lobes coarsely serrate toward the apex; flesh thin, yellow-green, dry and mealy; nutlets usually 3, broad, obtuse at the ends, rounded and prominently ridged on the back, with a wide rounded ridge, 8–9 mm. long.

A thin-stemmed shrub usually 1–2 m. high, rarely taller and almost arborescent in habit, with slender spreading branchlets yellow-green tinged with red when they first appear, bright red-brown or purple-brown and marked by few large pale lenticels during their first season, becoming dark gray-brown or reddish-brown the following year, and armed with numerous very slender bright chestnut-brown spines mostly 4–6 cm. long.

Berks county: West Leesport, *C. L. Gruber* (No. 89), 1902; near Kutztown, *C. L. Gruber* (Nos. 179, 180). Bucks county: Rockhill, near Sellersville, *C. D. Fretz* (No. 121), October, 1899, May and October, 1901, (No. 165), May and September, 1903; Durham, *Fretz and Sargent*, October, 1902. Delaware county: Upper Darby, near Collen Brook, *B. H. Smith* (No. 226), September, 1902, May and September, 1903. Also in New Castle County, Delaware.

9. *Cratægus reses* Ashe.

Jour. Elisha Mitchell Sci. Soc., Vol. XX, p. 55, 1904.

Leaves oval, to broadly ovate on vigorous shoots, acute or acuminate, gradually narrowed and concave-cuneate at the base, finely often doubly serrate, with straight or incurved gland-tipped teeth, and divided above the middle into 3 or 4 pairs of short broad acute lobes, more than half-grown when the flowers open about the 20th of May and then membranaceous, more or less tinged with red and slightly hairy along the midribs and veins above and pale and glabrous below, and at maturity thick and firm to subcoriaceous, dark dull bluish-green and smooth on the upper and light yellow-green on the lower surface, 4–5.6 cm. long and 3–5 cm. wide, with thick yellow midribs, and slender primary veins extending obliquely to the points of the lobes, turning dark red-bronze or scarlet-bronze mottled with green in the autumn before falling; petioles stout, deeply grooved and while young slightly hairy on the upper side, broadly winged toward the apex or nearly to the middle, glabrous at maturity, glandular, with minute dark often persistent glands, tinged with red toward the base after midsummer, and 1.5–2.5 cm. in length; stipules lanceolate, acuminate, elongated,

glandular, with minute glands, generally deciduous before the flowers open. *Flowers* 1.8–2.2 cm. in diameter, on long stout glabrous or rarely slightly hairy pedicels, in usually 6- or 7-flowered compact corymbs, with large and conspicuous oblong-obovate to linear glandular-viscid bracts and bractlets persistent until the flowers open; calyx-tube broadly obconic, glabrous, the lobes abruptly narrowed from wide bases, slender, acuminate, glandular above the middle, with small bright red stipitate glands, glabrous on the outer, sparingly villose on the inner surface toward the apex; stamens 10–18, usually 10–11; anthers cream color; styles 3–5, rarely 3. *Fruit* ripening toward the middle of October and often persistent until the middle of November, on stout reddish elongated erect pedicels, in few-fruited clusters, obovate when fully grown, becoming globose or depressed-globose and slightly tapering to the base or rarely pyriform-globose or oblong-globose at maturity, full and rounded at the apex, gradually narrowed to the base, dark red, sparingly blotched with russet or dark green, marked by many small pale green dots, 1.2–1.4 cm. long and 1.4–1.7 cm. thick; calyx little enlarged, with a long narrow prominent tube and reflexed lobes mostly deciduous from the ripe fruit; flesh thin, greenish-yellow and dry; nutlets 4 or 5, full and rounded at the base, gradually narrowed and rounded at the apex, ridged on the back, with a broad low slightly grooved ridge, about 8 mm. long and 4 mm. wide.

A narrow shrub about 2 m. high, with erect stems covered with dark brown bark, and slender nearly straight branchlets marked by occasional small oblong pale lenticels, orange or purplish when they first appear, bright chestnut-brown and lustrous during their first year and dark dull brown the following season, and armed with slender nearly straight chestnut-brown shining spines 2.5–3 cm. in length.

Berks county: Open oak woods, North Heidelberg, *C. L. Gruber* (No. 147), 1902, May and October, 1904; *Gruber* and *Sargent*, October, 1904.

10. *Cratægus inducta* Ashe.

Jour. Elisha Mitchell Sci. Soc., Vol. XIX, pt. I, p. 24 (1903).—*Gruber*, Proc. Berks County Nat. Sci. Club, I, 15 (*Cratægus* in Berks County, II).

Leaves ovate to oval or rarely slightly obovate, acute or acuminate, gradually narrowed into a long concave-cuneate glandular base, sharply doubly serrate above, with gland-tipped teeth, and divided above the middle into 3 or 4 pairs of large acute spreading or reflexed lobes, when they unfold dark red and slightly hairy on the upper and faintly tinged with red and glabrous on the lower surface, nearly half-grown when the flowers open about the 20th of May and then membranaceous, dark

yellow-green and slightly hairy above along the midribs and pale and glabrous below, and at maturity thin, dark yellow-green on the upper, pale on the lower surface, 6-7 cm. long and 4.5-5.5 cm. wide, with slender light yellow midribs, and thin primary veins arching obliquely to the points of the lobes; petioles slender, grooved on the upper side, narrowly wing-margined sometimes to the middle, glandular, with minute dark persistent glands and 2-3 cm. long; stipules oblong-obovate to linear, acuminate, glandular, often deciduous before the flowers open. *Flowers* 2-2.3 cm. in diameter, on long slender glabrous pedicels, in 4-8-flowered corymbs, with large obovate to linear glandular bracts and bractlets usually persistent until the flowers open; calyx-tube broadly obconic, the lobes gradually narrowed from wide bases, acuminate, coarsely glandular-serrate above the middle, glabrous on the outer, sparingly villose on the inner surface, reflexed after anthesis; stamens 8-13, usually 10; anthers pink or light rose color; styles 3 or 4, surrounded at the base by a narrow ring of pale hairs. *Fruit* ripening early in October and persistent until after the fall of the leaves, on slender pedicels, in spreading few-fruited clusters, subglobose to short oblong, rounded at the ends, greenish-bronze to pale red-bronze color, marked by small pale dots, 1.2-1.4 cm. in diameter; calyx little enlarged, with a short tube, a deep narrow cavity, and spreading appressed lobes, their tips mostly deciduous from the ripe fruit; flesh thin, greenish-yellow, hard and dry; nutlets usually 3, rounded at the ends, ridged on the broad back, with a prominent deeply grooved ridge, 8-9 mm. long and 4-5 mm. wide.

A shrub 2-3 m. high, with slender ascending stems and branches covered with dark almost black bark, and slender nearly straight branchlets marked by large oblong pale lenticels, orange or reddish-brown when they first appear, dull reddish-brown during their first winter and darker the following year, and armed with slender nearly straight purplish spines 3-5 cm. long.

Berks county: Open woods, West Leesport, *C. L. Gruber* (No. 88, type, Nos. 86 and 112), 1902, May and October, 1904; North Heidelberg, *C. L. Gruber* (No. 150), with larger leaves and fruit; near Kutztown, *C. L. Gruber* (No. 147), 1902, September, 1903, April, 1904. Delaware county: Davis Hill, Chadsford, *B. H. Smith* (No. 244), May, 1904; *Smith* and *Sargent*, September, 1904.

No. 198 of B. H. Smith, from Preston Run Barrens (*Crataegus definita* Sarg.), was referred to *Crataegus inducta* by Mr. Ashe (in letter to B. H. Smith, November, 1901), and is probably his only authority for this species in Delaware county (see his description of the species), as *Crataegus inducta* was not found at Chadsford until the spring of 1904.

11. *Cratægus definita* n. sp.

Leaves ovate to oval, acute, full and rounded at the wide often unsymmetrical base, finely doubly serrate above, with straight glandular teeth, and irregularly divided into 2 or 3 pairs of short broad acute lobes, fully grown when the flowers open at the end of May and then membranaceous, glabrous with the exception of a few hairs on the upper side of the midribs, very smooth and light yellow-green above and pale below, and at maturity thin but firm in texture, yellow-green, 4-5 cm. long and wide, with slender yellow midribs and thin veins arching obliquely to the points of the lobes; petioles stout, wing-margined toward the apex, puberulous on the upper side while young, becoming glabrous, glandular, with minute glands, 1-2 cm. in length. *Flowers* about 2 cm. in diameter, on slender elongated glabrous pedicels, in 5- or 6-flowered compact corymbs, with large conspicuous lanceolate coarsely glandular-serrate viscid reddish bracts and bractlets persistent until after the flowers have opened; calyx-tube narrowly obconic, glabrous, the lobes broadly foliaceous, coarsely laciniately serrate at the acuminate apex, reflexed after anthesis; stamens 6-8; anthers pale pink; styles 3 or 4, surrounded at the base by a narrow margin of pale hairs. *Fruit* subglobose to short-oblong, somewhat narrowed at the base, full and rounded at the apex, green or greenish-yellow, about 1 cm. in diameter; flesh thick, green, dry and mealy; nutlets 3 or 4, rounded and obtuse at the ends, slightly ridged on the broad rounded back, with a narrow ridge, about 8 mm. long and 4 mm. wide.

A shrub about 2 m. high, with slender branchlets marked by oblong pale lenticels, dark orange color when they first appear, dark red-brown during their first year, becoming dark gray tinged with red, and armed with slender straight dark purplish spines 5-6 cm. in length.

Delaware county: Preston Run Barrens, Newtown, *B. H. Smith* (No. 198, type!), May and September, 1901. Rare.

This species, which is still imperfectly known, resembles in general appearance *Cratægus peckii* Sarg. of the Hudson River Valley, but differs from that species in the absence of hairs on the lower side of the shorter and comparatively broader leaves, by the more slender entirely glabrous pedicels, and in the smaller number of stamens.

12. *Cratægus painteriana* n. sp.

Leaves oval to obovate or rhombic, acute, gradually narrowed and concave-cuneate at the entire or glandular base, finely doubly serrate above, with straight glandular teeth and deeply divided above the middle into 3 or 4 pairs of narrow acuminate lobes, slightly tinged with red and glabrous with the exception of a few soft hairs on the upper

side of the midribs and veins when they unfold, more than half-grown when the flowers open about the 20th of May and then membranaceous, light green and nearly glabrous above and pale below, and at maturity thin, smooth, dark yellow-green on the upper and paler on the lower surface, 4–5 cm. long and 2.5–3 cm. wide, with slender yellow midribs and thin primary veins arching to the points of the lobes; petioles slender, slightly grooved on the upper side, more or less wing-margined toward the apex, glandular, with minute persistent dark glands, 1–2 cm. in length; stipules lanceolate, glandular, fading brown, usually deciduous before the flowers open; leaves on vigorous shoots broadly ovate, abruptly cuneate at the wide base, often three-lobed by deep narrow sinuses, coarsely serrate, frequently 6 cm. long and wide, with stout broadly winged conspicuously glandular petioles. *Flowers* 1.6–1.8 cm. in diameter, on long slender glabrous pedicels, in usually 4–6-flowered corymbs, with oblong-obovate to linear glandular bracts and bractlets mostly deciduous before the flowers open; calyx-tube narrowly obconic, the lobes slender, acuminate, entire or slightly serrate toward the apex, reflexed after anthesis; stamens 8–10; anthers pale pink; styles 3 or 4. *Fruit* ripening the middle of October and soon falling, on long slender red pedicels, in usually 2 or 3-fruited clusters, subglobose to short-oblong, sometimes rather broader than high, orange color or orange-red, about 1.2 cm. in diameter; calyx prominent, with a short tube, a broad deep cavity and slender lobes, their tips generally deciduous from the ripe fruit; flesh thick, light yellow-green, dry and mealy; nutlets usually 3, full and rounded at the base, narrow and rounded at the apex, ridged on the back, with a high narrow ridge, 8–9 mm. long and about 5 mm. wide.

A shrub 2–3 m. high, with numerous small erect dark stems forming an open irregular head and slender nearly straight branchlets marked by minute dark lenticels, light orange color when they first appear, light red-brown and lustrous during their first winter, becoming dull gray-brown, and armed with many slender nearly straight purple shining spines 3–6 cm. long.

Delaware county: Serpentine Barrens, common; Preston Run Barrens, Newtown, *B. H. Smith* (No. 205, type!), May and October, 1902, May, 1904, (No. 220), May, 1903; Lownes' Run, Springfield, *Smith* and *Sargent* (No. 214), September, 1902; *B. H. Smith*, May and October, 1903.

This species is named in memory of the botanists, Marshall Painter (1801–1873) and Jacob Painter (1814–1876), his brother, natives of Middletown, Delaware county, where they planted and maintained a

collection of rare trees and shrubs (see Harshberger, *The Botanists of Philadelphia and Their Work*, pp. 184 and 210).

13. *Crataegus fulva* n. sp.

Leaves oval, acute or acuminate, cuneate or concave-cuneate at the entire or glandular base, finely doubly serrate above, with straight gland-tipped teeth, and slightly divided usually only above the middle into 3 or 4 pairs of short broad acute lobes, when they unfold deeply tinged with red, and hairy above, with soft white hairs, about half-grown when the flowers open from the 20th to the 25th of May, and then dark green and still slightly hairy above and pale below, and at maturity membranaceous, dark bluish-green, very smooth, and glabrous or nearly glabrous on the upper and pale or glaucous on the lower surface, 4.5–5 cm. long and 3–4 cm. wide, with thin orange-colored midribs and 3 or 4 pairs of slender primary veins; petioles slender, grooved on the upper side, slightly wing-margined at the apex, glandular, with minute dark scattered persistent glands, often orange color at maturity, 1.5–2.5 cm. in length; stipules linear-obovate, glandular, fading brown or red, mostly deciduous before the flowers open; leaves on vigorous shoots often ovate, full and rounded at the serrate base, sometimes deeply lobed, about 7 cm. long and 6 cm. wide. *Flowers* 2–2.5 cm. in diameter, on slender reddish-glabrous pedicels, in small 1–6-flowered simple corymbs, with obovate to linear dark red glandular-serrate viscid bracts and bractlets; calyx-tube broadly obconic, the lobes wide, acuminate, coarsely glandular-serrate usually only above the middle; stamens 5–9; anthers pale pink; styles 2–4, usually 3–4. *Fruit* ripening early in October and falling with or after the leaves, on slender erect pedicels, solitary or in 2- or 3-flowered clusters, obovate, or when fully ripe oblong-globose to globose, rounded at the apex, gradually narrowed at the base, orange color tinged with red or red-bronze, 1–1.3 cm. long and 8–12 mm. wide; calyx only slightly enlarged, with a short tube, a wide deep cavity, and spreading and reflexed lobes deciduous from the ripe fruit; nutlets 3 or 4, full and obtuse at the ends, very slightly ridged on the broad rounded back, about 6 mm. long and 3–4 mm. wide.

A shrub 1–2 m. high, with few thin wand-like stems, covered with green or yellow-gray bark, very slender nearly straight branchlets marked by occasional large pale lenticels, dark reddish-brown when they first appear, chestnut-brown and lustrous during their first winter and dull gray-brown the following year, and armed with few very slender nearly straight purplish shining spines 2–4 cm. long.

Berks county: Borders of woods, in gravelly soil, above Forge Hill,

North Heidelberg township, *C. L. Gruber* (No. 178, type!), 1903, May, and October, 1904.

14. *Cratægus pygmæa* n. sp.

Leaves oval, acuminate, gradually narrowed and concave-cuneate at the entire base, coarsely doubly serrate above, with spreading teeth tipped with large dark glands, not lobed, more than half-grown when the flowers open about the 25th of May and then membranaceous, yellow-green and roughened above by short white hairs, and light yellow-green and glabrous below, and at maturity thin but firm in texture, dark yellow-green, smooth or scabrate on the upper and pale on the lower surface, 4–4.5 cm. long and 2–2.5 cm. wide, with slender midribs tinged with red below, and obscure primary veins; petioles slender, wing-margined at the apex, slightly grooved on the upper side, glabrous, glandular while young with numerous dark caducous glands, dark red early in the season, 1.5–1.8 cm. in length; stipules linear, obovate, finely glandular-serrate, mostly deciduous before the flowers open; leaves on vigorous shoots ovate, rounded or concave-cuneate at the broad base, coarsely serrate, divided above the middle by broad shallow sinuses into short acute lobes, subcoriaceous and sometimes 6 cm. long and 5 cm. wide, with stout broadly winged petioles furnished with persistent glands, and foliaceous lunate coarsely glandular-serrate stipules. *Flowers* about 1.5 cm. in diameter, on slender glabrous pedicels, in 5–7-flowered simple corymbs, with linear acute glandular bracts and bractlets, fading red and mostly persistent until the flowers open; calyx broadly obconic, the lobes narrow, acuminate, glabrous, entire or finely and irregularly glandular-serrate above the middle; stamens 5; anthers cream color, faintly tinged with pink; styles 2–4. *Fruit* ripening about the 20th of September, on slender erect pedicels, in 1–4-fruited clusters, oblong-obovate, rounded at the apex, gradually narrowed to the base, dark crimson, lustrous, marked by occasional small pale dots, 1.2–1.4 cm. long, 8–11 mm. wide; calyx prominent, with a short tube, a deep narrow cavity and much enlarged coarsely serrate reflexed and appressed lobes dark red on the upper side below the middle, and mostly persistent on the ripe fruit; flesh thin, dark yellow, dry and mealy; nutlets usually 3, obtuse and rounded at the ends, ridged on the back, with a broad often grooved ridge, dark colored, 6–7 mm. long and about 5 mm. wide.

A shrub, with slender stems 1–2 m. high covered with pale gray bark, and slender nearly straight branchlets marked by numerous small pale lenticels, green more or less tinged with red when they first appear, bright chestnut-brown and lustrous at the end of their first season and

dull gray-brown tinged with red the following year, and armed with occasional slender straight purplish spines 2-3.5 cm. in length.

Bucks county: Roadsides near Sellersville, *Fretz* and *Sargent* (No. 161, type!), September, 1902; *C. D. Fretz*, May, 1905.

15. *Cratægus infera* n. sp.

Leaves ovate to oblong-ovate, acuminate, concave-cuneate at the entire or glandular base, coarsely doubly serrate above, with straight gland-tipped teeth, and slightly divided into 4 or 5 pairs of small acute lobes, when they unfold dark purple and coated above by long white hairs and slightly hairy below on the midribs and veins, nearly half-grown when the flowers open about the 20th of May and then membranaceous, light yellow-green and nearly glabrous on the upper and pale or glaucous and glabrous on the lower surface, and at maturity thin but firm in texture, dark yellow-green and scabrate or smooth above, pale below, 5-6 cm. long, 3.5-4 cm. wide, with slender yellow midribs, and obscure primary veins arching obliquely to the points of the lobes, turning dull orange color or scarlet in the autumn before falling; petioles slender, deeply grooved, narrowly wing-margined to below the middle, sparingly villose on the upper side while young, soon glabrous, glandular, with minute dark red stipitate glands, 1.5-2 cm. in length; stipules linear, acuminate, glandular-serrate, caducous; leaves on vigorous shoots ovate, cuneate or rounded at the broad base, more coarsely serrate, more deeply lobed, and 5-6 cm. long and broad. *Flowers* 1.5-1.7 cm. in diameter, on slender slightly hairy pedicels, in 3-6-flowered simple corymbs, with linear obovate glandular-hispid bracts and bractlets generally deciduous before the flowers open; calyx-tube broadly obconic, glabrous, the lobes gradually narrowed from wide bases, coarsely and irregularly serrate above the middle, or nearly entire, glabrous on the outer, slightly villose on the inner surface toward the apiculate glandular apex, reflexed after anthesis; stamens 8-10; anthers large, light purple; styles 2 or 3, surrounded at the base by a ring of pale hairs. *Fruit* ripening from the 20th to the end of September, on short stout erect reddish pedicels, solitary or in few-fruited clusters, obovate, full and rounded at the apex, gradually narrowed below the middle to the rounded base, dark reddish-orange color, marked by occasional large dark dots, about 1.2 cm. long and 1-1.1 cm. wide; calyx little enlarged, with a small shallow cavity, and spreading and reflexed lobes often deciduous from the ripe fruit; flesh thin, orange color, dry and mealy; nutlets 2 or 3, full and rounded at the base, gradually narrowed and rounded at the apex, ridged on the back, with a wide deeply grooved ridge, light colored, 7-8 mm. long and about 4 mm. wide.

A shrub 1–2 m. high, with small erect stems and slender slightly zigzag branchlets marked by numerous small pale lenticels, orange-green more or less tinged with red when they first appear, bright chestnut-brown and very lustrous during their first winter, and dull dark gray or brown tinged with red the following year, and armed with slender slightly grooved red-brown or purplish spines often pointing toward the base of the branch, and 4–5 cm. in length.

Bucks county: Roadsides near Sellersville, *Fretz* and *Sargent* (No. 162, type!), September, 1902; *C. D. Fretz* (No. 162), May, 1905, (No. 199), May, 1905.

16. *Crataegus schweinitziana* n. sp.

Leaves rhombic or slightly obovate, acuminate, gradually narrowed and concave-cuneate at the entire or occasionally glandular base, finely doubly serrate above, with straight gland-tipped teeth, and divided into 3 or 4 pairs of short broad acuminate lobes, nearly one-third grown when the flowers open about the 20th of May and then membranaceous, light yellow-green and glabrous with the exception of a few short hairs on the upper side of the midribs, and at maturity subcoriaceous, glabrous, dark yellow-green on the upper and paler on the lower surface, 4–5 cm. long and 3–4 cm. wide, with thin prominent yellow midribs, and slender primary veins arching obliquely to the points of the lobes; petioles slender, grooved on the upper side, more or less wing-margined at the apex, glandular, with minute stipitate dark mostly deciduous glands, 1–1.5 cm. in length; leaves on vigorous shoots broadly ovate, full and rounded or abruptly cuneate at the wide base, coarsely serrate, more deeply lobed, 5–6 cm. long and 4.5–5 cm. wide, with thick midribs and stout conspicuously glandular petioles broadly winged below the middle. *Flowers* 1.7–1.8 cm. in diameter, on slender glabrous pedicels, in 4–6-flowered simple corymbs, with linear-obovate to linear-acuminate glandular bracts and bractlets, fading pink, and usually persistent until after the petals have fallen; calyx-tube narrowly obconic, the lobes broad, acuminate, finely glandular-serrate above the middle, glabrous, reflexed after anthesis; stamens 8–10, usually 10; anthers red; styles 3 or 4. *Fruit* ripening late in October, on slender pedicels, in spreading few-fruited clusters, oblong, full and rounded at the ends or often sometimes narrowed at the base, 1.2–1.4 cm. long, 8–9 mm. thick, dark red; calyx enlarged and prominent with a short tube, a wide shallow cavity, and spreading lobes mostly deciduous from the ripe fruit; flesh thin, yellowish-green, dry and mealy; nutlets 3 or 4, gradually narrowed and rounded at the ends, ridged on the back, with a high narrow ridge, 8–9 mm. long and about 5 mm. wide.

A shrub about 2 m. high, with numerous ascending stems covered with smooth greenish-gray bark, and slender zigzag branchlets marked by numerous small pale lenticels, light orange color when they first appear, bright chestnut-brown and very lustrous during their first winter, becoming light gray tinged with red, and armed with numerous stout or slender nearly straight dark purplish shining spines 4–6 cm. long.

Bucks county: Roadsides near Sellersville, *C. D. Fretz* (No. 119, type!), September, 1899, May and October, 1901.

This species is named in memory of Louis David de Schweinitz (1780–1834), the distinguished Pennsylvania botanist.

17. *Cratægus darlingtoniana* n. sp.

Leaves oblong-ovate, acuminate, gradually narrowed and concave-cuneate at the entire or serrate base, sharply doubly serrate above, with straight gland-tipped teeth, and divided above the middle into 3 or 4 pairs of narrow acute lobes, at maturity thin but firm in texture, glabrous, dark yellow-green on the upper and pale yellow-green on the lower surface, 3.5–4 cm. long and 2–2.5 cm. wide, with slender red or reddish midribs, and thin primary veins extending obliquely to the points of the lobes; petioles very slender, slightly grooved on the upper side, wing-margined at the apex, glandular, with minute dark glands, reddish toward the base, 1–1.2 cm. in diameter; leaves on vigorous shoots broadly ovate, sometimes rounded at the wide base, more coarsely serrate and more deeply divided into broad lateral lobes, and sometimes 5–6 cm. long and 3.5–4 cm. wide, with stout petioles broadly winged nearly to the base. *Flowers* unknown. *Fruit* ripening early in October, on short slender pedicels, in few-fruited clusters, short-oblong to depressed-globose, full and rounded at the ends, bright canary-yellow, 1.2–1.4 cm. in diameter; calyx with a short tube and a broad deep cavity, the lobes deciduous from the ripe fruit; flesh thin, sweet, light yellow; nutlets 3 or 4; rounded and obtuse at the ends, ridged on the back, with a high narrow or broad grooved ridge, about 7 mm. long and 5 mm. wide.

A shrub 1–2 m. high, with slender nearly straight bright chestnut-brown lustrous branches, becoming dull red-brown in their second year and marked by numerous small oblong pale lenticels.

Chester county: Serpentine Ridge, near West Chester, *Canby* and *Smith* (No. 228, type!), October 8, 1902.

The dry ridge where this plant and several other dwarf forms of *Cratægus* were found by Canby and Smith was burnt over after their visit. The plants were all killed to the ground, and, although the

flowers are not yet known, I do not hesitate to describe this species, as the very distinct beautiful clear yellow fruit is different from that of any other of the recognized species. It is named for William Darlington (1782-1861), of West Chester, the distinguished Pennsylvania botanist and the author of the *Flora Cestricea*.

IX.—UNIFLORÆ.

Leaves crenately serrate, 1. *C. uniflora*.
 Leaves with straight teeth, 2. *C. smithii*.

1. *Cratægus uniflora* Muench.

Hausv., V, 147 (1770).—Sargent, Silva N. Am., IV, 117, t. 191.—Porter, Fl. Penn., 177.

Cratægus parviflora Aiton, Hort. Kew., II, 169 (1789).—Watson and Coulter, Gray's Man., ed. 6, 166.

Berks county: Near Kutztown, *C. L. Gruber* (No. 74), 1902. Bucks county: Near Sellersville, *C. D. Fretz* (No. 22), May and July, 1899. Delaware county: Lownes' Run, Springfield, *B. H. Smith* (No. 202), May, 1902 and 1904.

2. *Cratægus smithii* Sarg.

Trees and Shrubs, I, 67, t. 34 (1903).

Cratægus vailiæ Small, Porter, Fl. Penn., 177 (not Britton) (1903).

Leaves obovate, rounded or acute at the apex, gradually narrowed from near the middle to the concave-cuneate entire glandular base, finely and doubly serrate above, with straight gland-tipped teeth, and occasionally divided into short terminal lobes; nearly fully grown when the flowers open about the 20th of May and then membranaceous, slightly viscid, bright yellow-green and roughened above by short white hairs, paler, and villose below along the slender midribs, and usually three pairs of thin primary veins extending to the apex of the leaf; at maturity subcoriaceous, very dark yellow-green, lustrous and scabrate on the upper, pale and still slightly hairy on the lower surface, 2.3-3 cm. long and 1.2-2.2 cm. wide; petioles short, wing-margined nearly to the base, villose early in the season, pubescent in the autumn, 4-5 mm. long; stipules oblong and acuminate to lanceolate, glandular, turning brown in fading, caducous. *Flowers* about 1.6 cm. in diameter, solitary or occasionally in 2- or 3-flowered clusters, on short stout villose pedicels; then bractlets linear to oblong, glandular, caducous; calyx-tube narrowly obconic, villose, the lobes foliaceous, broad-ovate, acuminate, conspicuously serrate, with slender teeth tipped with minute red glands, reflexed when the flowers open; stamens twenty; anthers pale yellow; styles 5, or rarely 6. *Fruit* ripening from the middle to

the end of September, erect on short stout slightly hairy pedicels, short-oblong, full and rounded at the ends, orange or orange-green to bronze-green when ripe, lustrous, about 1.5 cm. long and 1.2 cm. wide; calyx enlarged, sessile, with a broad deep cavity, and reflexed and closely appressed lobes; flesh thin, green and hard; nutlets 5, rarely 6, thick, gradually narrowed to the acute ends, irregularly ridged and deeply grooved on the back, 7 mm. long.

A dichotomously branched straggling shrub, from 1 to 2 m. in height, with slender nearly straight branchlets, orange-brown and coated when they appear with long pale matted hairs, dull reddish-brown and pubescent at the end of their first season and dark gray-brown the following year, and armed with very slender straight dark purple spines, ashy-gray and long persistent on the old stems, from 1.5–3 cm. in length.

Delaware county: Open hillsides along Lownes' Run, Springfield, *Dr. George Smith*, May, 1867; *B. H. Smith* (No. 201, type!), May, 1902; *Smith and Sargent*, September, 1902. Bucks county: Near Sellersville, *C. D. Fretz* (No. 182), May and September, 1903.

X.—TOMENTOSÆ.

Leaves thin, with midribs and veins only slightly impressed on their upper surface; fruit obovate to oblong, orange or orange-red; stamens 20.

Anthers rose color, 1. *C. tomentosa*.

Anthers yellow, 2. *C. structilis*.

Leaves subcoriaceous to coriaceous, with midribs and veins deeply impressed on their upper surface; fruit subglobose to short-oval, usually scarlet.

Stamens 20.

Anthers rose color or pink.

Leaves villose below at maturity.

Pedicels villose; fruit long-stalked, in drooping clusters, often 1.5 cm. in diameter; leaves elliptical, acute at the ends; anthers light or dark rose color, 3. *C. succulenta*.

Pedicels glabrous; fruit on erect pedicels, in few-fruited clusters, about 1 cm. in diameter; leaves rhombic to obovate; anthers pale pink, 4. *C. radiosa*.

Leaves nearly glabrous below at maturity, ovate to oval or obovate; fruit on erect glabrous pedicels, in few-fruited clusters, 7–8 mm. in diameter; anthers dark rose color,

5. *C. micrantha*.

Anthers yellow; leaves rhombic to oval; fruit on drooping slightly villose pedicels, in many-fruited clusters, 6. *C. opica*.

Stamens 10; anthers pale yellow; leaves ovate to rhombic; fruit on erect or spreading glabrous pedicels, in few-fruited clusters,

7. *C. chadsfordiana*.

1. *Cratægus tomentosa* Linnæus.

Spec., 476 (1753).—Sargent, *Silva N. Am.*, IV, 101, t. 183; *Man.*, 492, f. 406.

Cratægus cerea Gruber, Berks County Nat. Sci. Club, I, 3 (*Cratægus* in Berks County, II) (without description) (1903).

Bucks county: Near Sellersville, *C. D. Fretz* (Nos. 21 and 167), June and September, 1899, 1901, 1903; Durham, *Fretz* and *Sargent*, 1902. Berks county: Near Kutztown, *C. L. Gruber* (No. 37), 1901, June and October, 1903. Northampton county: Chestnut Hill, Easton, *T. C. Porter*, May, 1889.

Gruber's No. 127, a small tree near Kutztown, seems to differ from *Cratægus tomentosa* only in its short-oblong to subglobose (not pyriform) bright red-orange fruit, and requires further study.

2. *Cratægus struotilis* Ashe.

Jour. Elisha Mitchell Sci. Soc., XIX, 12 (1903).—Gruber, *Proc. Berks County Nat. Sci. Club*, I, 3 (*Cratægus* in Berks County, II).

Leaves oblong-ovate to oval or obovate, acuminate, gradually narrowed to the slender concave-cuneate entire base, coarsely doubly serrate above, with straight glandular teeth, and slightly divided above the middle into numerous short acuminate lobes, nearly fully grown when the flowers open during the first week of June and then membranaceous, yellow-green and covered above by short soft white hairs most abundant on the midribs and veins, and pale and hoary-pubescent below, and at maturity thin but firm in texture, dark green and glabrous or nearly glabrous on the upper and pale and puberulous on the slender midribs and primary veins below, 7–8 cm. long and 4.5–5 cm. wide; petioles stout; deeply grooved on the upper side, broadly wing-margined to below the middle, hoary-tomentose while young, puberulous later in the season, 1–1.5 cm. in length. *Flowers* 1.4–1.8 cm. in diameter, on stout hoary-tomentose pedicels, in wide compact many-flowered tomentose corymbs, with linear acuminate glandular bracts and bractlets fading brown; calyx-tube broadly obconic, hoary-tomentose, the lobes narrow, acuminate, slightly serrate usually only near the middle, puberulous, reflexed after anthesis; stamens 20; anthers pale yellow; styles 2, surrounded at the base by a narrow ring of white tomentum. *Fruit* ripening about the 1st of October, and mostly persistent until after the leaves have fallen, on stout erect puberulous pedicels, in wide many-fruited erect or spreading clusters, oblong to obovate, narrowed at the ends, orange-scarlet, lustrous, 8–10 mm. long, 6–7 mm. wide; calyx prominent, with a long groove, a deep narrow cavity, and spreading appressed pubescent lobes mostly deciduous from the ripe fruit; flesh thick, orange color, sweet and succulent; nut-

lets 2, rounded and obtuse at the ends, obscurely ridged on the broad rounded back, penetrated on the inner face by wide grooves, 5-6 mm. long and about 4 mm. wide.

A tree 5-6 m. high, with a tall slender stem covered with dark gray scaly bark, spreading or ascending branches forming a broad round-topped head, and slender nearly straight branchlets marked by many large pale lenticels, dark orange color and hoary-tomentose when they first appear, bright chestnut-brown and puberulous during their first winter and dark gray-brown the following year, and sparingly armed with slender dark gray spines 2-5 cm. long, becoming elongated and much-branched on old stems and branches.

Berks county: Banks of Sacony Creek, near Kutztown, *C. L. Gruber* (No. 24), June and October, 1903. Bucks county: Near Sellersville, *C. D. Fretz* (No. 21), June and October, 1903.

3. *Cratægus succulenta* Link.

Handb., II, 78 (1831).—Sargent, *Silva N. Am.*, XIII, 139, t. 131; Man. 497, f. 411.

Berks county: Near Kutztown, *C. L. Gruber* (No. 166), May and September, 1903. Bucks county: Near Sellersville, *C. D. Fretz* (Nos. 19 and 20), May, 1899, May and October, 1901. Delaware county: Crum Creek, below Castle Rock Park, *B. H. Smith* (No. 190), May and July, 1900, September, 1903; *Smith and Sargent*, September, 1902. Northampton county: Easton, *T. C. Porter*, June, 1893.

4. *Cratægus radiosa* n. sp.

Leaves rhombic to obovate, acute, acuminate or rarely rounded at the apex, gradually tapering and concave-cuneate at the entire base, finely often doubly serrate above, with straight glandular teeth, and divided above the middle into several short broad lobes, nearly fully grown when the flowers open from the 15th to the 20th of May and then membranaceous, light yellow-green and sparingly villose along the midribs and veins above, and pale and slightly hairy on the midribs and in the axils of the primary veins below, and at maturity subcoriaceous to coriaceous, dark green and lustrous on the upper and pale and still hairy on the lower surface, 5-8 cm. long and 4-5 cm. wide; petioles stout, wing-margined toward the apex, puberulous while young along the deep groove on their upper side, without glands, 1-2.5 cm. in length; stipules linear, acuminate, fading brown, caducous. *Flowers* about 1.5 cm. in diameter, on slender elongated glabrous pedicels, in wide many-flowered glabrous corymbs, with oblong-obovate to linear serrate bracts and bractlets mostly deciduous before the flowers open; calyx-tube narrowly obconic, the lobes foliaceous, acuminate, deeply

laciniately serrate above the middle, with gland-tipped teeth, glabrous on the outer, sparingly villose on the inner surface, reflexed after anthesis; stamens 20; anthers pale pink; styles 2 or 3. *Fruit* ripening early in September and mostly falling before October, on stout erect pedicels, in few-fruited clusters, subglobose, rounded at the apex, truncate and concave at base, bright cherry-red, lustrous, about 1 cm. in diameter; calyx little enlarged, with a narrow deep cavity, and spreading reflexed lobes often deciduous from the ripe fruit; flesh thick, succulent, dark orange-yellow; nutlets 2 or 3, full and rounded at the obtuse ends, prominently ridged on the back, with a broad deeply grooved ridge, penetrated on the inner face by short irregular deep cavities, 5-6 mm. long and about 4 mm. wide.

A tree 3-4 m. high, with a trunk 1-1.5 m. long and 1-1.3 dm. in diameter, covered with thin close gray bark, heavy spreading branches forming a handsome round-topped head, and stout zigzag glabrous branchlets marked by large oblong pale lenticels, light orange color when they first appear, becoming bright chestnut-red and very lustrous before autumn and gray tinged with red the following year, and armed with numerous slender or slightly curved purplish or red-brown shining spines 6-8 cm. long.

Delaware county: Banks of Collen Brook, Upper Darby, *Smith* and *Sargent* (No. 215, type!), September, 1902; *B. H. Smith*, May and September, 1903, May, 1904.

5. *Cratægus micrantha* n. sp.

Leaves ovate to oval or obovate, acute or obtuse and rounded at the apex; gradually or abruptly narrowed to the cuneate entire base, sharply doubly serrate above, with straight gland-tipped teeth, and slightly divided above the middle into short acuminate lobes, nearly fully grown when the flowers open about the 20th of May and then membranaceous, yellow-green and puberulous along the midribs above and pale and glabrous below, with the exception of a few sometimes persistent hairs in the axils of the primary veins, and at maturity subcoriaceous, dark green, lustrous and glabrous on the upper and pale and dull on the lower surface, 4-5.5 cm. long and 3-4 cm. wide, with stout yellow midribs, and prominent veins extending obliquely to the points of the lobes; petioles slender, grooved on the upper side, narrowly wing-margined below the middle, sparingly glandular, 8-14 mm. in diameter. *Flowers* 8-10 mm. in diameter, on slender elongated glabrous pedicels, in broad many-flowered compound corymbs, with linear acuminate finely glandular-serrate rose-colored caducous bracts and bractlets; calyx-tube narrowly obconic, the lobes slender, elongated,

acuminate, deeply glandular-serrate, with small bright red glands, glabrous on the outer, hairy on the inner surface, with pale matted hairs, reflexed after anthesis; stamens 20; anthers dark rose color; styles 2 or 3. *Fruit* ripening the end of September and soon falling, on slender erect reddish pedicels, in few-fruited clusters, subglobose, orange-red, lustrous, marked by occasional pale dots, 7–8 mm. in diameter; calyx little enlarged, with a short tube, a narrow deep cavity, and closely appressed lobes often deciduous from the ripe fruit; flesh very thin, yellow, dry and mealy; nutlets 2 or 3, obtuse at the ends, ridged on the back, with a high narrow ridge, penetrated on the inner face by broad shallow grooves, about 4 mm. long and 3 mm. wide.

A shrub with numerous small much-branched stems 2–3 m. high, with slender nearly straight branchlets marked by oblong pale lenticels, dark orange-colored and glabrous when they first appear, becoming light chestnut-brown and very lustrous during their first season and dull gray-brown the following year, and armed with numerous slender straight or slightly curved purplish ultimately gray-brown spines 3.5–4.5 cm. in length.

Bucks county: Dry banks of streams near Sellersville, *C. D. Fretz* (No. 183, type), May and September, 1903. Berks county: Rocky ridge near Kutztown, *C. L. Gruber* (No. 1), May and August, 1903.

6. *Cratægus opica* Ashe.

Jour. Elisha Mitchell Sci. Soc., Vol. XIX, p. 10 (1903).—Gruber, Proc. Berks County Nat. Sci. Club, I, 3 (*Cratægus* in Berks County, II).

Leaves rhombic to oval, acuminate, concave-cuneate at the entire base, finely often doubly serrate above, and sometimes slightly divided toward the apex into 3 or 4 pairs of broad acute lobes, nearly fully grown when the flowers open about the 20th of May and then membranaceous, dark yellow-green, very smooth and puberulous along the midribs above and pale or glaucous and glabrous with the exception of a few short hairs in the axils of the veins below, and at maturity coriaceous and glabrous, dark green and lustrous on the upper and pale and conspicuously reticulate-venulose on the lower surface, 6–7 cm. long and 4–5 cm. wide, with stout orange-colored midribs, and slender veins extending obliquely to the points of the lobes; petioles stout, broadly wing-margined from the apex sometimes to below the middle, deeply grooved, without glands, puberulous while young on the upper side, soon glabrous, 1.5–2 cm. in length; stipules linear-lanceolate, minutely glandular, fading brown, caducous. *Flowers* 1.4–1.6 cm. in diameter, on stout elongated villose pedicels, in broad many-flowered compact hairy corymbs, with oblong-obovate to linear acuminate

glandular bracts and bractlets mostly deciduous before the flowers open; calyx-tube narrowly obconic, villose at the base only, the lobes gradually narrowed, acuminate, deeply laciniately serrate, with gland-tipped teeth, glabrous on the outer, slightly villose on the inner surface, reflexed after anthesis; stamens 20; anthers pale yellow; styles 2 or 3, surrounded at the base by a narrow ring of pale tomentum. *Fruit* ripening early in October, on long red slightly hairy spreading or drooping pedicels, in many-fruited clusters, depressed-globose to short-oblong, scarlet, lustrous, translucent when fully ripe, 1-1.2 cm. in diameter; calyx enlarged and prominent, with a deep narrow cavity, and spreading and reflexed coarsely serrate lobes villose above, often deciduous from the ripe fruit; flesh thick, dark yellow, and succulent; nutlets 2 or 3, full and rounded at the base, gradually narrowed to the acute apex, ridged on the back with a high narrow ridge, penetrated on the inner faces by deep wide cavities, dark colored, about 5 mm. long and 3-4 mm. wide.

A tree 4-7 m. high, with a slender stem covered with dark nearly black scaly bark, short spreading branches forming a narrow oblong or oval crown and slender nearly straight glabrous branchlets marked by oblong pale lenticels, light orange color when they first appear, light red-brown and lustrous during their first winter and gray tinged with red the following year, and armed with numerous slender nearly straight purplish spines 3-3.5 cm. long, becoming much elongated, branched and dark gray on old stems and branches, or often shrubby.

Berks county: Near Sacony Creek, in the neighborhood of Kutztown, *C. L. Gruber* (No. 23, type!), 1901, May and September, 1903. Bucks county: Durham, *C. D. Fretz* (No. 154), May, 1901; *Fretz* and *Sargent*, September, 1902; near Sellersville, *C. D. Fretz* (No. 158), June, 1901.

7. *Cratægus chadsfordiana* n. sp.

Leaves ovate to rhombic, acute or acuminate, cuneate or rarely rounded at the entire base, coarsely doubly serrate above, with straight gland-tipped teeth, and divided into 4 or 5 pairs of small acuminate lateral lobes, more than half-grown when the flowers open about the 20th of May and then membranaceous, light yellow-green, very smooth and glabrous with the exception of a few scattered white hairs above, and pale or glaucous and slightly villose in the axils of the primary veins below, and at maturity subcoriaceous, dark yellow-green, lustrous and glabrous on the upper, light yellow-green and glabrous with the exception of small tufts of axillary hairs on the lower surface, 6-7 cm. long and 5-6.5 cm. wide, with stout yellow midribs, and slender veins extend-

ing very obliquely to the points of the lobes; petioles stout, deeply grooved on the upper side, wing-margined toward the apex, slightly hairy while young, soon glabrous, occasionally glandular, with minute stipitate persistent glands and 2-2.5 cm. in length; leaves on vigorous shoots often full and rounded at the base, more deeply lobed and more coarsely serrate. *Flowers* 2-2.2 cm. in diameter, on long slender glabrous pedicels, in 5-9-flowered glabrous corymbs, with linear acuminate glandular bracts and bractlets, fading red; calyx-tube narrowly obconic, glabrous, the lobes slender, acuminate, nearly entire or glandular-serrate, glabrous on the outer and sparingly villose on the inner surface, reflexed after anthesis; stamens 10; anthers pale yellow; styles 2-4. *Fruit* ripening about the 20th of September, on long stout erect or spreading pedicels, in few-fruited clusters, subglobose, often somewhat narrowed at the base, scarlet, lustrous, marked by occasional large pale dots, 1-1.4 cm. in diameter; calyx little enlarged, with a wide shallow cavity and spreading lobes mostly deciduous from the ripe fruit; flesh thick, yellow, dry and mealy; nutlets usually 3 or 4, gradually narrowed to the rounded ends, prominently ridged on the back, with a high narrow ridge, dark colored, penetrated on the inner faces by narrow deep grooves, 7-8 mm. long and 4-5 mm. wide.

A shrub 2-3 m. high, with stout ascending stems and slender nearly straight branchlets marked by oblong pale lenticels, dark orange color and glabrous when they first appear, becoming bright red-brown and lustrous before winter, and dull and darker colored the following season, and armed with many stout or slender nearly straight purple shining spines often pointing toward the base of the branch and 5-7 cm. long.

Delaware county: Wooded slopes at Chadsford, *B. H. Smith* (No. 225, type!), September, 1902, May, 1903, May, 1904; *W. M. Canby*, October, 1902.

Crataegus chadsfordiana is closely related to *Crataegus dumicola* Sarg., of the Aroostook Valley, Maine, but differs from that species in its larger flowers, glabrous pedicels, usually larger fruit, darker colored nutlets and much thicker leaves.

Crataegus cordata Ait., from the south and west, and *Crataegus oxyantha* L., from Europe, have become naturalized in eastern Pennsylvania.